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# THE NEW HARVARD MEDICAL SCHOOL

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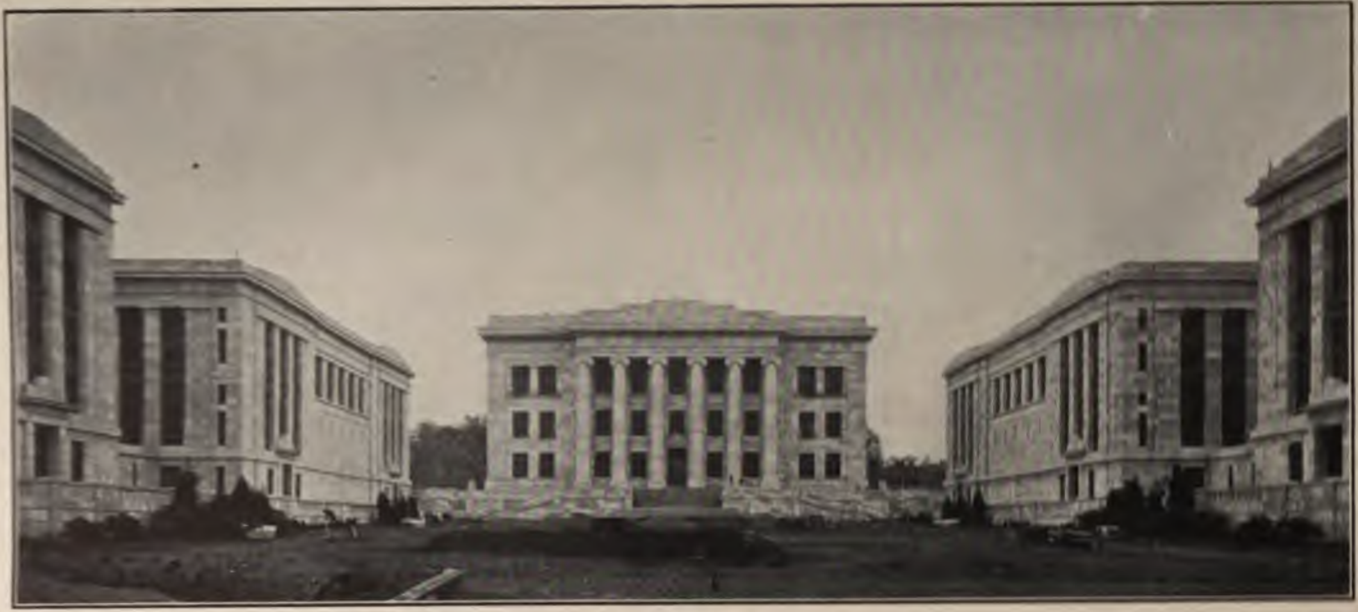

HARVARD MEDICAL SCHOOL,

General View.

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## THE NEW HARVARD MEDICAL SCHOOL.

### THE ARCHITECTS' WORK.

The new Harvard Medical School buildings on Longwood Ave., with the imposing Administration building on a high terrace flanked by the simpler laboratory buildings, all with their terraces enclosing a quadrangle, form an architectural group almost unique in this country, where architectural grouping is in an early stage of development. When the suggestions for the general improvement of the city of Boston along architectural lines has been realized, the effectiveness of the Medical School group will be still more enhanced, particularly by the boulevard which it is proposed to build on the axis of the court extending to the Fenway.

In designing these buildings the architects, Messrs. Shepley, Rutan & Coolidge, made effective their formal setting and character by using a simple classic style, an adaptation from the Greek, the simple mouldings and other detail giving strength and accent to the main architectural features. The design was executed by the Norcross Brothers Co., entirely of white marble from quarries at Dorset, Vermont, under the direction of the architects and Mr. C. H. Alden, Jr., who represented the architects in the details of construction.

The exterior design expresses the interior arrangement planned to meet the requirements of modern medical instruction and the special needs of the School, which have changed materially since the old building on Boylston St. was built. These changes which affect the planning of the new buildings are mainly the substitution of smaller section teaching laboratories in place of laboratories accommodating large classes and the increased demand for research work. The four laboratory buildings are symmetrical and similar in design. The laboratories and other workrooms are in wings extending to the rear, arranged so that the departments of instruction most closely affiliated with each other are in the same building. These wings are connected together by a central portion fronting on the court. The central portion contains the amphitheatre and library, common to the several departments. The wings extending to the rear are a repetition of piers and windows, a practical adaptation of the "unit system" originally devised for laboratory construction by Prof. W. T. Porter of the Harvard Medical School, and developed more fully by Prof. C. S. Minot, also of the Harvard Medical School, in his articles published in the scientific magazines. In Dr. Minot's system the most practical size for a laboratory was fixed at 23 x 30 feet, accommodating 24 students. This size for a laboratory governed the design

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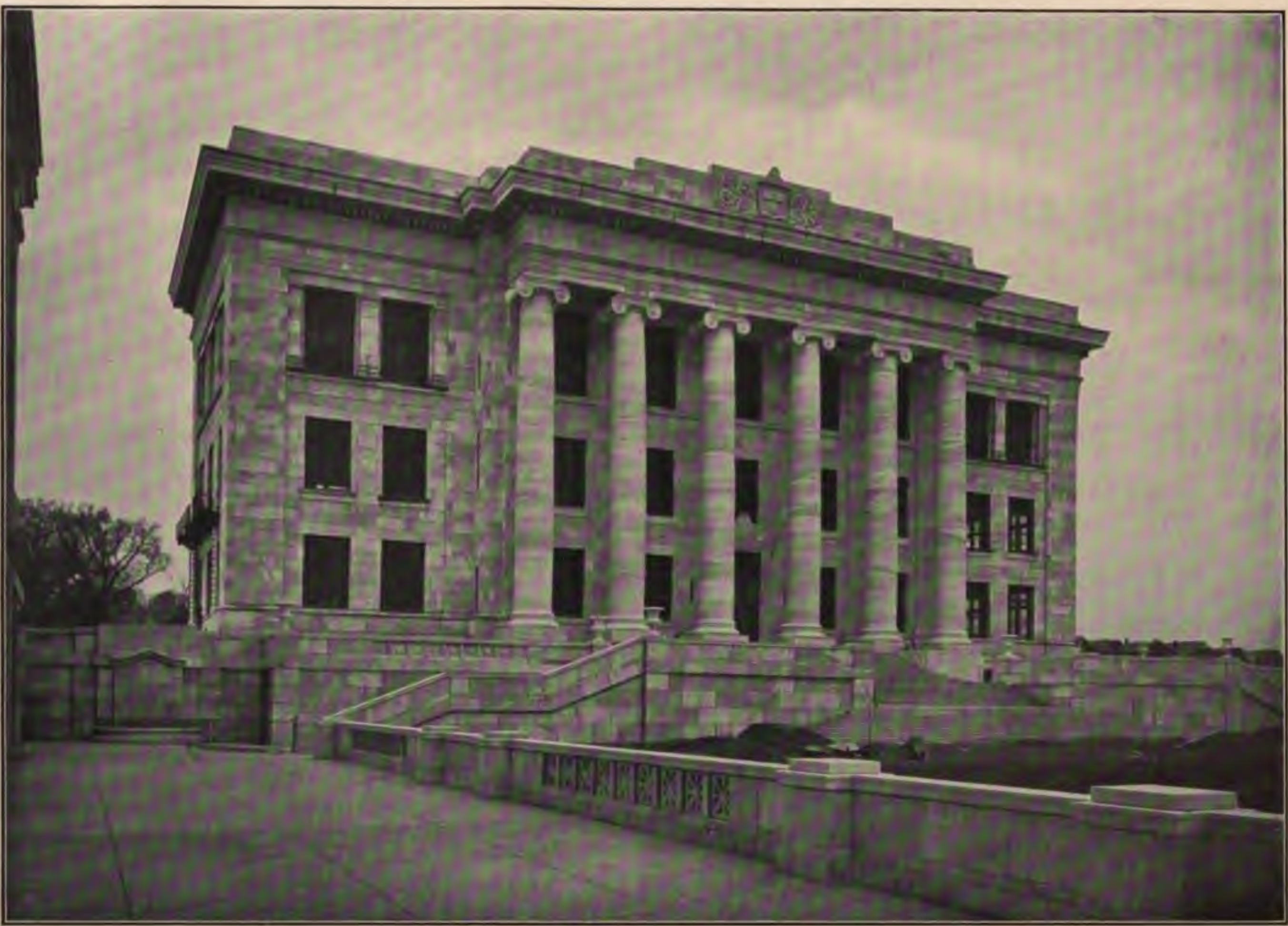
in the present buildings, each unit laboratory to contain three window units, smaller rooms for professors' personal use two window units, and rooms for individual research one window unit. These laboratories and other work-rooms are arranged on each side of a central corridor, and the corridor walls made the fixed portion of the interior construction containing the ducts for heating and ventilating the several rooms. The partitions between the rooms are of thin terra-cotta only, and can be easily removed or new ones built, so that rooms other than those originally provided can be made in the future to meet different requirements of the School. Provision is also made for future extension; the wings may be lengthened to the rear by adding additional units of piers and windows, and when extended to a distance of a little over 200 feet may be connected together enclosing a court 112 feet by 70 feet. This virtually trebles the capacity of each building, with practically no diminution of light or interference with architectural design.

The division of the buildings into stories is a further development of the plan. Where the large laboratories for general students' use are located, the stories are high and windows carried to the ceiling, giving abundant light in all parts of the room sufficient for microscope work. Where smaller rooms (as for individual research) are to be provided, this height is obviously not required, and economy of space is obtained and rooms made of better proportion by building intervening or "mezzanine" stories. Economy of space is still further obtained by the system of floor construction. This is of reinforced concrete. Each floor between the piers is a simple slab of concrete reinforced by steel bars to give strength and minimum thickness.

All the buildings are connected by corridors, the lower floors being on the same level throughout, the grade of the land on the outside being equalized by terraces. These corridors in addition to their use for communication are made wide to contain lockers for students' use. Under the connecting corridors, under the buildings, and extending underground to the Power House, is a tunnel through which the service pipes are carried to furnish heat and light, water, refrigeration, etc., to the different buildings.

### ADMINISTRATION BUILDING.

The Administration Building, not being intended for laboratory purposes, presented a different problem in plan and exterior design. As suited to its character, it is more monumental than the buildings on either side, which are designed for the practical work of the School. The broad steps lead up from the terrace and from the rear to the porticos of Ionic columns each over 50 feet high. Entering the building



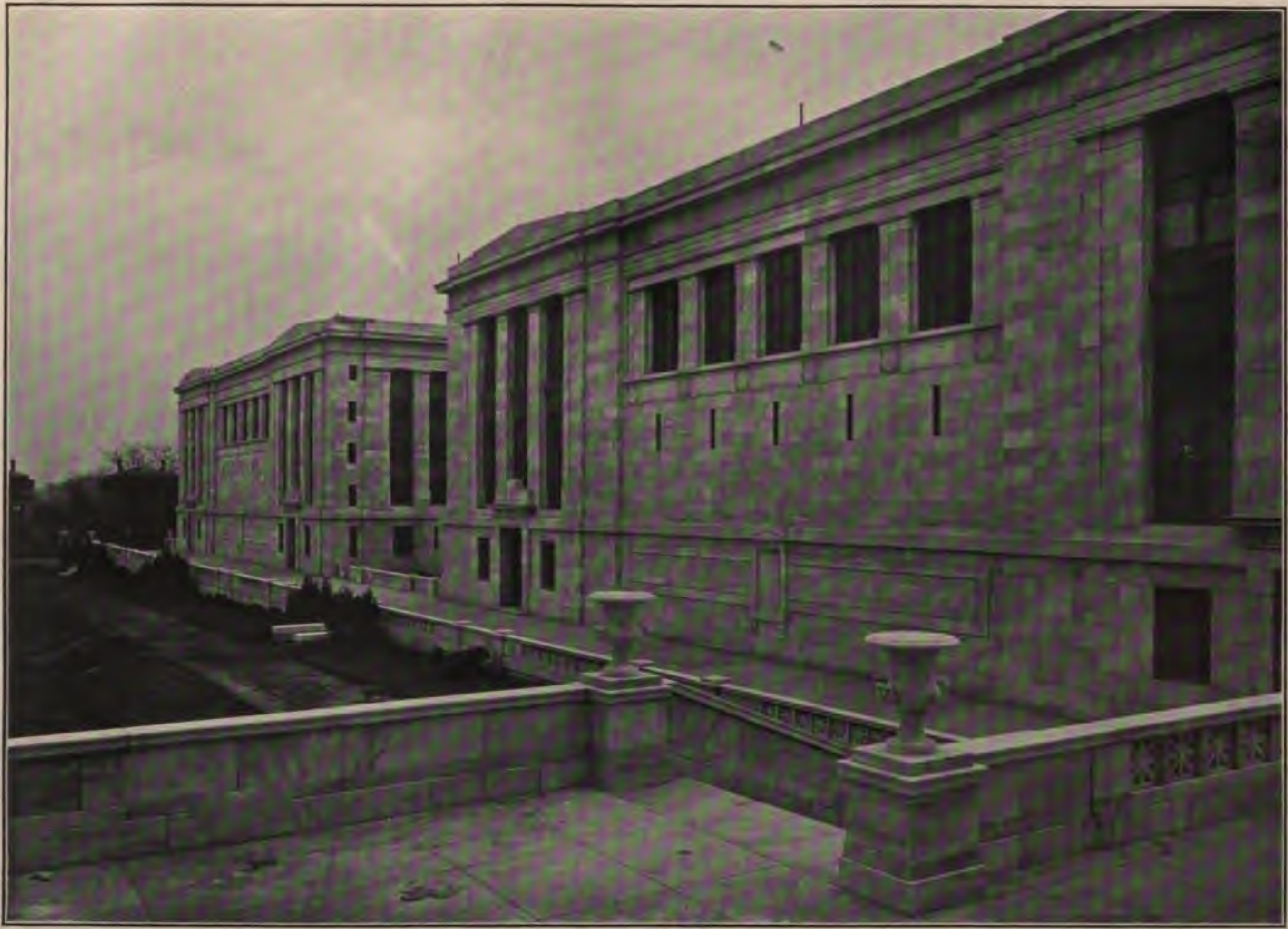
HARVARD MEDICAL SCHOOL,

Administration Building.

ing containing also the departments of Operative Surgery and Comparative Anatomy. Near the front entrance to the north or Anatomy wing are rooms for lecture preparation and a room for the attendant in charge of the department. The rear portion of this wing is devoted to the reception and storage of anatomical subjects, and is separated by double doors from the rest of the building. A driveway at the rear enters directly into the building where there are rooms at hand for storage of the full and empty coffins. Connecting with the coffin rooms is an injecting room where the cadaver is prepared for transference to the large refrigerator directly opposite. This refrigerator is divided into two compartments for economy in cooling and to facilitate cleaning. There is a vestibule between and a small cold room for storage of small specimens. The two compartments have together a capacity of 156 subjects on movable racks built in three tiers. The whole refrigerator is thoroughly insulated, and has sanitary floor and tiled walls. The cooling is by brine system with pipes in an attic above the rack, the refrigerating liquid being furnished from a plant in the Power House.

Most of the remaining space in this wing is used for dissecting. The typical dissecting-room was devised by Dr. Franklin Dexter, and consists of a room 23 x 30 feet, the typical section teaching-unit. Each room has a floor sloping to a gutter and drain, and contains four dissecting tables with special electric illumination overhead. A large sink, closet for skeleton, lockers for dissecting instruments, and work-bench around the walls, complete the equipment of the room. A portion of the floor above contains the Department of Operative Surgery. This has laboratories with movable dissecting tables, rooms for the instructors, and for keeping instruments. The large room on the front of this floor is at present utilized as an extra dissecting room. The floor above has in its west corner, convenient to stairs and elevator, a Demonstrating Room with seating arranged to accommodate a maximum number of students, giving each a near and clear view of the subject under demonstration. The students enter by stairs from the hall, and the subject is taken from the elevator through the preparation room. The elevator in this building is conveniently located for transporting anatomical material and for passenger service. Both elevator and stairs ascend to roof, where rooms are provided for macerating and corrosion. All rooms where anatomical work is carried on are protected from outside view by windows which are translucent only.

In the north wing practically the entire ground floor is assigned to Comparative Anatomy, and as this department is at present undeveloped a few rooms only are furnished. Section teaching-rooms are provided with tables for students' use, and in the rear a smaller laboratory and



HARVARD MEDICAL SCHOOL,

Looking from the Administration Building.

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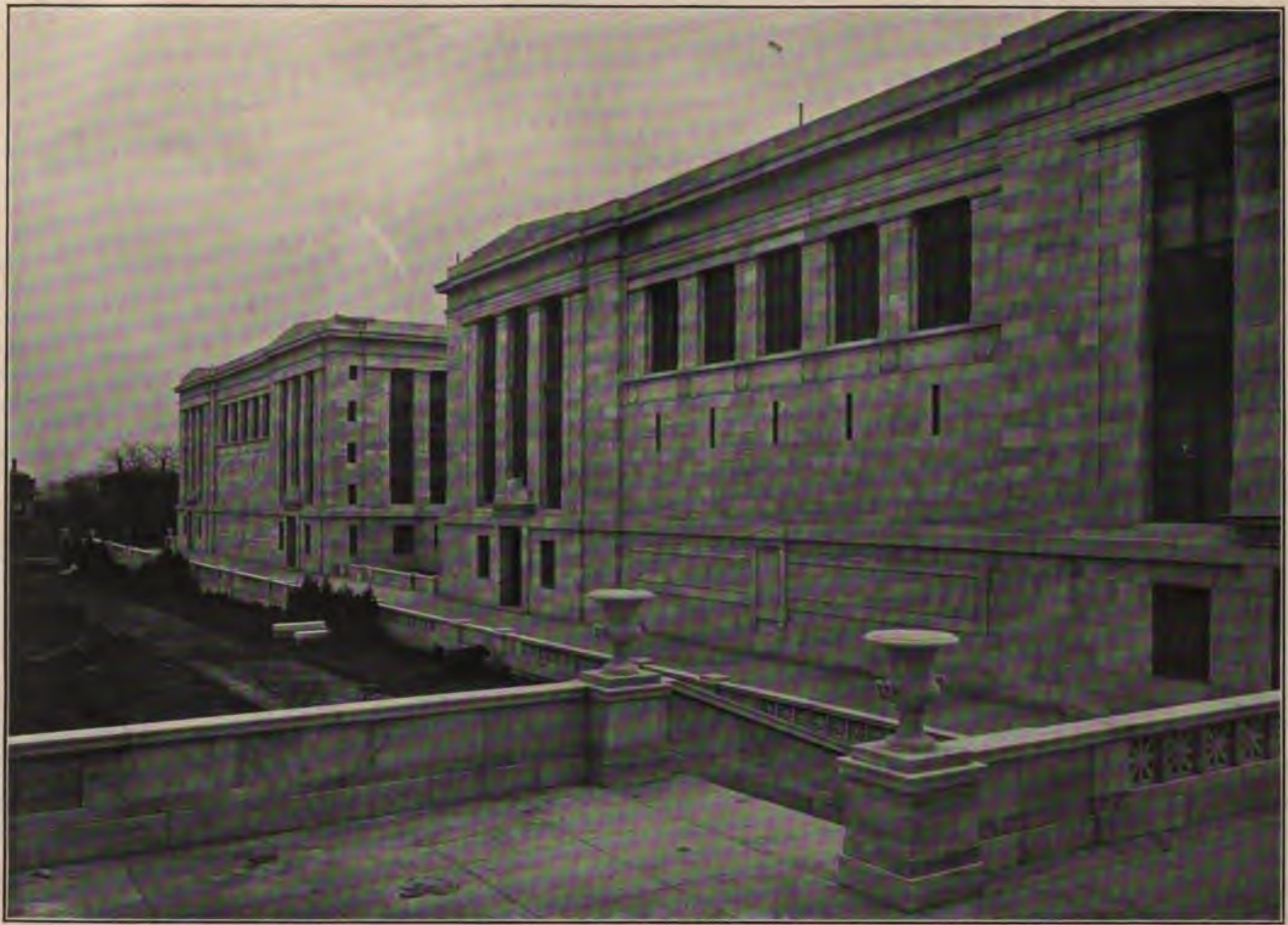


HARVARD MEDICAL SCHOOL,

Looking from the Administration Building.

rooms for aquaria and work on large animals. This latter room has special entrance from outside and provision for hauling the subject into the building. The floors above contain the students' laboratories of histology and a few rooms for professors' and instructors' use. The histological laboratory is the fundamental section teaching-room arranged by Dr. Minot. Each room has accommodations for 24 students working at desks arranged for work with the microscope. Each student has drawers and cupboard for keeping apparatus, and the tables are provided with gas and electric connections. There is a table for instructors' use, a table for ovens, cabinets for storage of apparatus, and a large sink with small supplies for washing specimens in addition to the general sink supply.

Following the general plan adopted for the laboratory buildings, the central portion between the two wings contains mainly the amphitheatre and library used in common by all departments in the building. The amphitheatre has entrances for the lecturer and his apparatus from the preparation rooms on the ground floor, one in each wing, where lecture material may be stored, prepared, and wheeled on a movable table directly in place in the amphitheatre. The students enter from the halls on the story above, and between the two levels are the tiers of seats so arranged as to give each student an unobstructed view. The plan, location of seats and arrangement of wall and ceiling surfaces were carefully arranged for acoustic properties after consultation with Prof. Sabine of Harvard University, the only thorough investigator of architectural acoustics. Each amphitheatre has 265 seats. These seats and the provision for lantern projection are arranged similar to the amphitheatre in the Administration Building. The windows are darkened by heavy shades, and to darken the ceiling light a heavy shade slides over it, operated by electric motor controlled from below. The library above opens from a corridor connecting the two wings, and has an attractive architectural character suited to a library and reading-room. The bookcases lining the walls, the walls and ceilings and general finish are simple and classic in design, and of a color restful to the eyes.

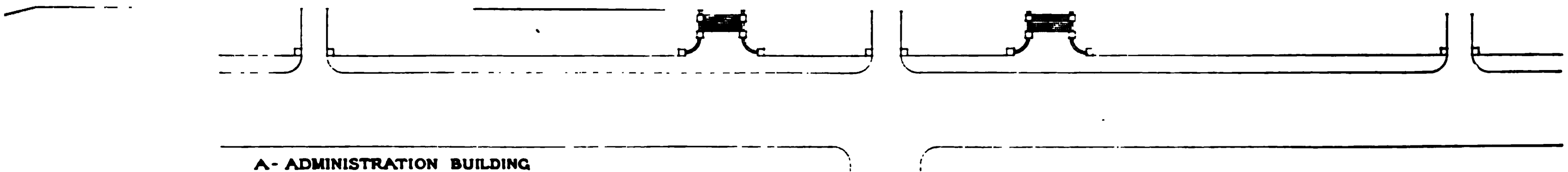
### PHYSIOLOGY AND PHYSIOLOGICAL CHEMISTRY BUILDING.

Directly opposite the Anatomy and Histology Building, with front exactly similar, to balance the architectural scheme, is the building assigned to Physiology and Physiological Chemistry. Entering the ground floor of the southwest or Physiology wing, from the terrace through the large door and vestibule, we find first the rooms for storing lecture material and other apparatus, and further in the rear a machine shop and a galvanometer-room with masonry foundations for the instruments. The floor above is devoted to laboratory uses made up of the unit section teaching laboratory devised by Dr. Porter. This laboratory is the typical size, 23 × 30 feet, accommodating 24 students. The 12 students' tables are arranged opposite the windows. Each table contains a sink supplied with water, gas, and electric connections and drawers and cupboards under for storage of apparatus. On the rear wall opposite an aisle between the rows of desks is a hood with special exhaust by mechanical means. These hoods have lining and floor of English tile and connections inside for water, gas, compressed air, steam, and electricity. A large sink and glazed cabinets for storage of apparatus occupy the remainder of the available space. Water supplies are provided in each laboratory from a tank on the roof to give constant pressure.

To furnish dark rooms for instruction in ophthalmoscopy, portions of the corridors on this and the floor above are arranged to be shut off by rolling screens, and lights are arranged at intervals along the walls properly equipped for ophthalmoscopic work.

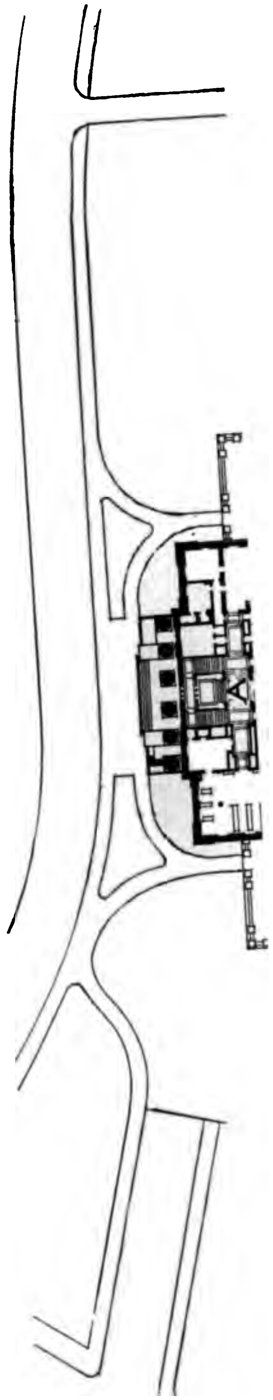
The upper portion of this building being intended mainly for research work contains an additional or " mezzanine " story following the general scheme outlined before. These research-rooms for Physiology have window tables, sinks and hoods similar to those in the students' laboratories. Other rooms on these floors are for professors' and instructors' use, and photography, and in the rear of the top floor an Animal Operating suite with rooms adjacent for animals undergoing special treatment. This operating suite has a wash-room, narcotizing and instrument room in addition to the operating room. All have terrazzo floors and special operating-room appliances. The animal quarters adjoining open from a special corridor and have sanitary floors with arrangement for cleaning. The general quarters for animals are on the roof directly accessible by elevator. These contain rooms for dogs, cats, rabbits, and isolation cages for small animals. The animals have abundant light and ventilation and exercise yards in the open air. There is also a large frog tank where frogs can be kept in running water.

The needs of the Chemistry Department, in the other wing of this building, called for slightly different arrangement of rooms and different details of fittings than those required for other departments. Towards this end, Dr. William R. Emerson of the Chemistry Department, with the architects, gave the subject careful study, and the resulting plan and equipment are an endeavor to meet these requirements. One large students' laboratory was deemed advisable in place of the smaller section teaching rooms. The general laboratory occupies the rear half of the second floor and has accommodations for 168 students, each provided with a desk of special design. These desks are arranged in rows between the central piers and windows. Each has a top of opaque glass made of



A- ADMINISTRATION BUILDING
B- ANATOMY AND HISTOLOGY BUILDING
C- PHYSIOLOGY AND PHYSIOLOGICAL
CHEMISTRY BUILDING
D- BACTERIOLOGY AND PATHOLOGY BUILDING
E- HYGIENE AND PHARMACOLOGY BUILDING
F- ANIMAL HOUSE

PLAN OF BASEMENTS



peculiar composition to resist the action of acids. At the back of each top is a drain and nipples for water and gas supplies to take rubber tube connection, recessed below so as not to interfere with the working spaces. These outlets are controlled by long armed cocks recessed in the face of the table. Each student has a set of drawers and a cupboard for storage of apparatus, these being all arranged to lock automatically by closing one drawer. All pipes for gas, water, etc., and the supports for the shelves are in a space between and independent of the desks, so that desks can be removed to facilitate repairs or adjustment of valves. At the end of each row of desks is a hood of glass and tile with gas outlets. Through these hoods the ventilation of the room is effected. A large sink is also at the end of each row of desks. The floor in common with the floors of all chemical work-rooms is of asphalt, and the walls and ceilings covered with zinc paint, all as precautions to resist the action of acids. Centrally located in the room are emergency showers as a safeguard in case of fire to clothing occasioned by explosion of apparatus. Rooms for storage and issuing supplies and a working-room for attendant are placed in connection with this large laboratory. The remaining rooms on this floor are laboratories for instructors, which are equipped with appliances similar in general to those in the students' laboratory. The centre tables, however, have provision for vacuum by means of water pumps placed under the desks, and a portion of the table opposite the window is equipped with a special microscope light. This is an electric fixture under the table, projecting light through an aperture directly through the microscope slide, without the intervention of the mirror.

On the floor below are rooms for various special uses. As we enter the building, beyond the store-room and lecture-preparation room is a combustion-room for work with the combustion furnace. This has slate-topped tables with hoods over them and large gas supplies for connecting the burners. Beyond is a small room for balances. The tables here are independent of each other and are supported by brackets on brick walls which are not a part of the construction of the building. This renders each balance independent of any external vibration. A laboratory for advanced course work is next towards the rear. The fittings of this room are similar in general character to those in other rooms, with more space for each student. The large hood of galvanized iron, glass, and tile, has a steam bath covered with non-corrosive metal and the holes closed by concentric rings to give different sized openings. The two rooms in the rear of the building have extra ventilation and are intended to be used for work giving rise to strong odors. Returning, on the south side of the corridor are two rooms with insulated walls. The first of these is for keeping supplies at a constant temperature, a vestibule and iron fence separating the portion used by the teaching staff from that used by the students. The next room is the refrigerator cooled by brine solution as in the large refrigerator in the anatomical department. All shelving in these insulated rooms is of galvanized iron. The next room is for large preparations and work not generally done in the other laboratories. Here there is provided a masonry pier in a space below the floor. To this pier a large centrifuge is attached, and being below the floor no damage can be done to other articles in the room by the throwing off of material or broken parts. The small yard opening from this room through French windows has broad parapet for holding cooling solutions.

The two upper floors of this wing, as in the Physiology Department, are mainly for individual research. The first of these floors has in the south corner a dark room for work with the spectroscope, and next to it a balance-room. Occupying the main portion of the north side is a microscope-room with tables fitted with special lights under, for direct projection through the slide as noticed before in the private laboratories. Across the corridor is a steam bathroom, with hood and steam bath occupying the entire end in front of the window. This hood is entirely of non-corrosive metal and glass, as are other hoods in this department. Connecting with this steam bathroom is a room with strong table for machinery, and across the corridor is a room for dialyzer and still, with large dialyzing trough and provision for still at the end of room, from which pipes lined with block-tin lead to the students' laboratories below. The top floor contains research-rooms, private laboratories, and an animal operating suite in the north corner with special appliances as in the Department of Physiology. The elevator and stairs in this wing, as in the other, ascend to the roof, to the animal quarters for use in the Department of Chemistry. These contain rooms for dogs, guinea pigs, and rabbits, opening directly into exercise yards.

The amphitheatre in this building is similar in design to that in the Anatomy Building, but a large and well-equipped lecture table is here a permanent fixture. This has a removable central portion built in duplicate, one for Physiology and one for Chemistry. This removable central portion can be wheeled to the preparation room, stored with apparatus, and wheeled back in its place, forming an integral part of the complete table. The fixed portion has water, gas, electricity, compressed air, and steam connections, a large sink, and provision for hood with exhaust through top of table by special exhaust fan. The library above is larger than in the building already described for Anatomy and Histology, and occupies the entire space on the third floor between the wings. This library has a regular stack floor in the rear, of ornamental iron and glass, space being left for an additional tier of stacks above. The architectural

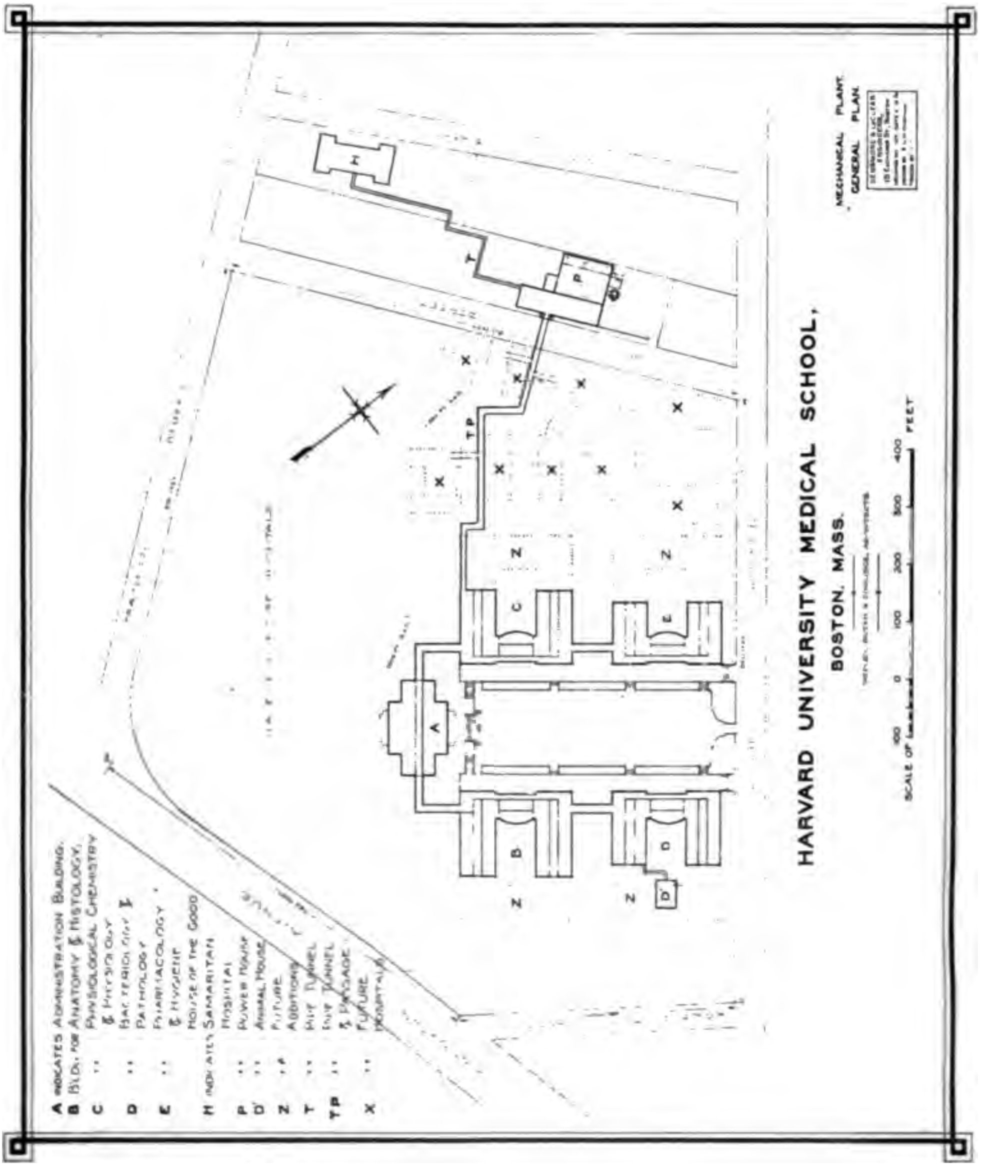

A indicates Administration Building.
B Bldg. for Anatomy & Histology.
C " Physiological Chemistry & Physiology
D " Bacteriology & Pathology
E " Pharmacology & Hygiene
H indicates Samaritan House of the Good Hospital
P " Power House
D' " Animal House
Z " Future Additions
T " Pipe Tunnel
TP " Pipe Tunnel & Passage
X " Future Hospitals
A
B
C
D
D'
E
H
P
T
TP
Z
X
HARVARD UNIVERSITY MEDICAL SCHOOL,
BOSTON, MASS.
MECHANICAL PLANT
GENERAL PLAN
SCALE OF FEET
100
0
100
200
300
400

FIGURE 1

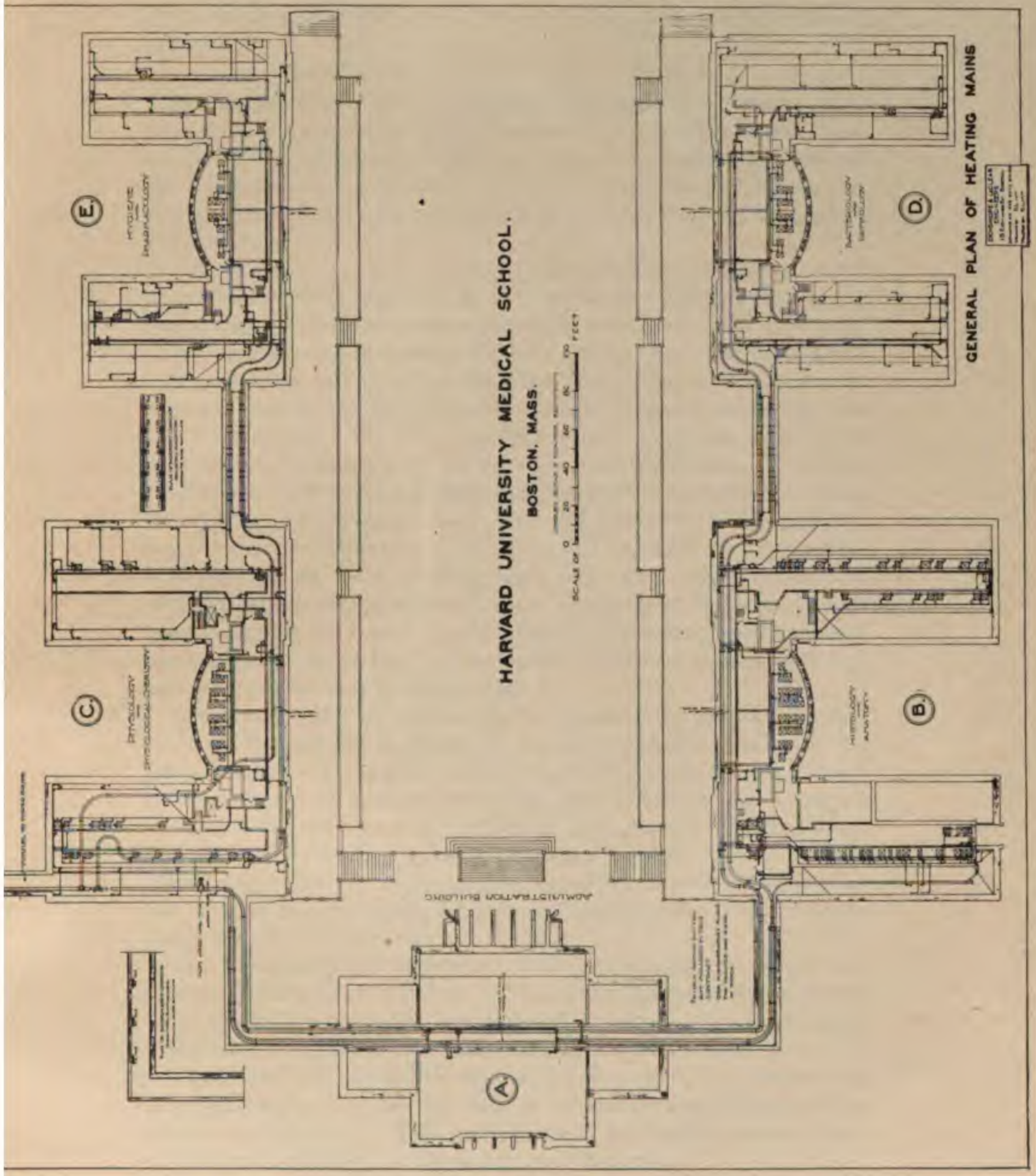

HARVARD UNIVERSITY MEDICAL SCHOOL.
BOSTON, MASS.
GENERAL PLAN OF HEATING MAINS
ADMINISTRATION BUILDING
A
B
HISTOLOGY AND ANATOMY
C
PHYSIOLOGY AND PHYSIOLOGICAL CHEMISTRY
D
BACTERIOLOGY AND PATHOLOGY
E
HYGIENE AND PHARMACOLOGY
SCALE OF FEET
0
20
40
60
80
100

FIGURE 2

character of the whole room is similar to the library in the building opposite.

### PHARMACOLOGY AND HYGIENE BUILDING.

Leaving the Physiology Building and going to the north toward Longwood Ave., we reach the building containing the Department of Pharmacology and Therapeutics in the south wing, with space assigned on the third floor to Surgical Research. The north wing has in the front portion the Department of Hygiene, and in the rear that of Comparative Pathology.

The main floor of the Pharmacology Department has a room on the front for metabolism experiments, and toward the rear a large laboratory for courses in pharmacy, with supply-room adjoining. The laboratory tables, each to accommodate six students, are equipped with sinks, water and gas outlets, and electric connections. All outlets are controlled by long arm-cocks in the face of the table. Other rooms on the ground floor are, a mechanical room with pier for a centrifuge, store-rooms, and a dark room containing a brick box for explosive experiments. The rooms on the floor above devoted to Pharmacology and Therapeutics are mainly laboratories and professors' rooms, equipped with tables as described for the pharmacy-course room. The second floor contains a room used for a library, and on the floor above there is a small demonstration-room with accommodations for 70 students. The Surgical Research Department, occupying the rear of the top floor, has a laboratory with an aseptic operating-room connecting, and across the corridor an animal-room and private rooms for the instructing staff.

In the north wing the ground floor contains in the front a large Museum of Hygiene for exhibiting foods and appliances relating to the general health. The rooms on floors above assigned to the Department of Hygiene are used mainly for small laboratories, and are equipped similarly to the corresponding rooms in the Department of Pharmacology. The library for this department is a small room on the top floor, and the space between the two wings elsewhere used for library purposes is in this building left unfinished, the present intention being to use it in the future for a general laboratory of Hygiene.

The Department of Comparative Pathology occupies the entire rear portion of this wing on all floors. It has on the two lower floors laboratories for students and professors, a room for autopsies, and small rooms to be used in connection with the laboratories. The upper floors are "mezzanines," and are divided into small rooms mainly for research and individual work. On this top floor is an animal operating-room with animal-room adjoining. The amphitheatre in this building is a duplicate of that in the Building for Physiology and Chemistry.

### BACTERIOLOGY AND PATHOLOGY BUILDING.

The remaining laboratory building on the other side of the court and also on Longwood Ave. is occupied by the Departments of Bacteriology and Pathology. In this building the research-rooms are concentrated in one wing, which is divided into mezzanine stories. This leaves the high stories in the north wing for the large students' laboratories, giving them northern exposure suitable for microscope work. The laboratories are four in number, each to accommodate 48 students, two at each desk. These desks are arranged for work with the microscope, having sinks with water supplies for wetting slides and other purposes, gas and electric connections, and drawers and cupboards for storing apparatus. The small rooms opposite the laboratories are demonstration-rooms, rooms for sterilizing, staining, etc. There is a large room on third floor for media work.

Passing to the wing divided into mezzanine stories, the first two floors above the ground floor are assigned to Pathology, and the two upper floors to Bacteriology. The typical Pathological Research room has window tables supplied with gas and electric connections, sink with small taps over the drain board, as in Histology, and shelves and drawers for storage. The four rooms in the rear of the third story contain the Department of Surgical Pathology, consisting of a laboratory equipped similarly to the typical research-room, a secretary's room, an operating room, and a room for histological technique. All these have work tables with gas and electric connections.

In the Bacteriology Department the small unit rooms are variously fitted up to meet different requirements. Besides the work-rooms for individual work, there are sterilizing-rooms with slate-topped tables with gas connections and hoods over them for the sterilizers, and incubator-rooms with the slate-topped tables inclosed in glazed doors to protect the incubators from drafts. Here the gas supplies are taken from a special main, to give a constant supply. Operating-rooms are on the southeast corner. Two rooms on the top floor are fitted up with typical laboratory tables, and are to be used for blood examination and advanced elective work.

The ground floor of this building contains, besides storage-rooms, the Department of Photography in the rear of the research wing. This provides for the various kinds of photographic work required. There is a camera-room with the typical photographic studio window for gross photography; rooms for photomicrographic work in bacteriology and pathology, and a room for enlarging. All these rooms have dark rooms directly connecting, with fittings carefully planned for photographers' use and the rooms made light tight.

The animal quarters for Bacteriology and Pathology are in a separate house directly to the rear of the main laboratory building. The material

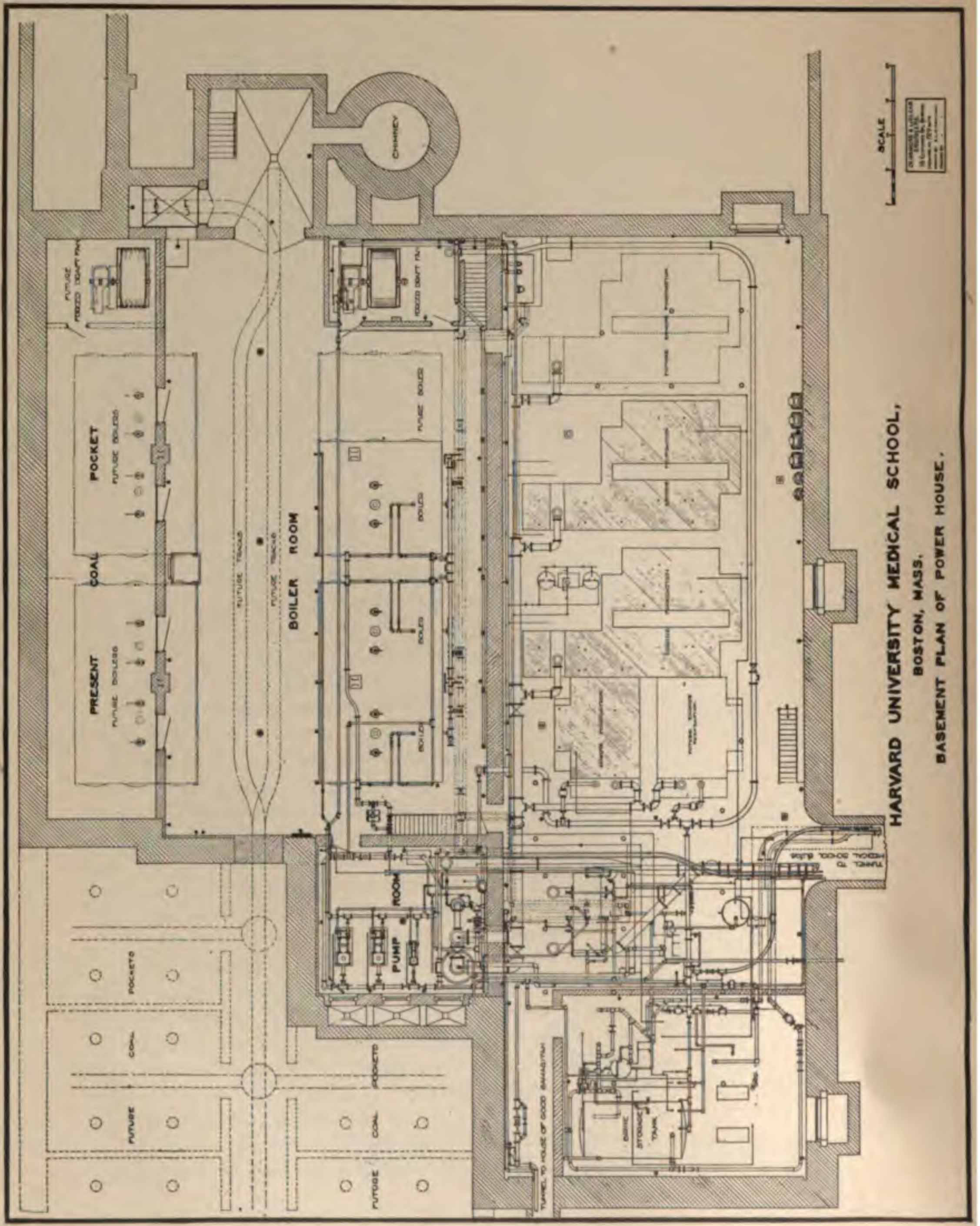

HARVARD UNIVERSITY MEDICAL SCHOOL,
BOSTON, MASS.
BASEMENT PLAN OF POWER HOUSE.
SCALE
CHIMNEY
FUTURE FORCED DRAFT FAN
FORCED DRAFT FAN
PRESENT
COAL
POCKET
FUTURE BOILERS
FUTURE TRACKS
BOILER ROOM
FUTURE BOILER
BOILER
PUMP ROOM
FUTURE COAL POCKETS
STORAGE TANK
TUNNEL TO HOUSE OF GOOD SAMARITAN
TUNNEL TO MEDICAL SCHOOL BLDG.

FIGURE 3

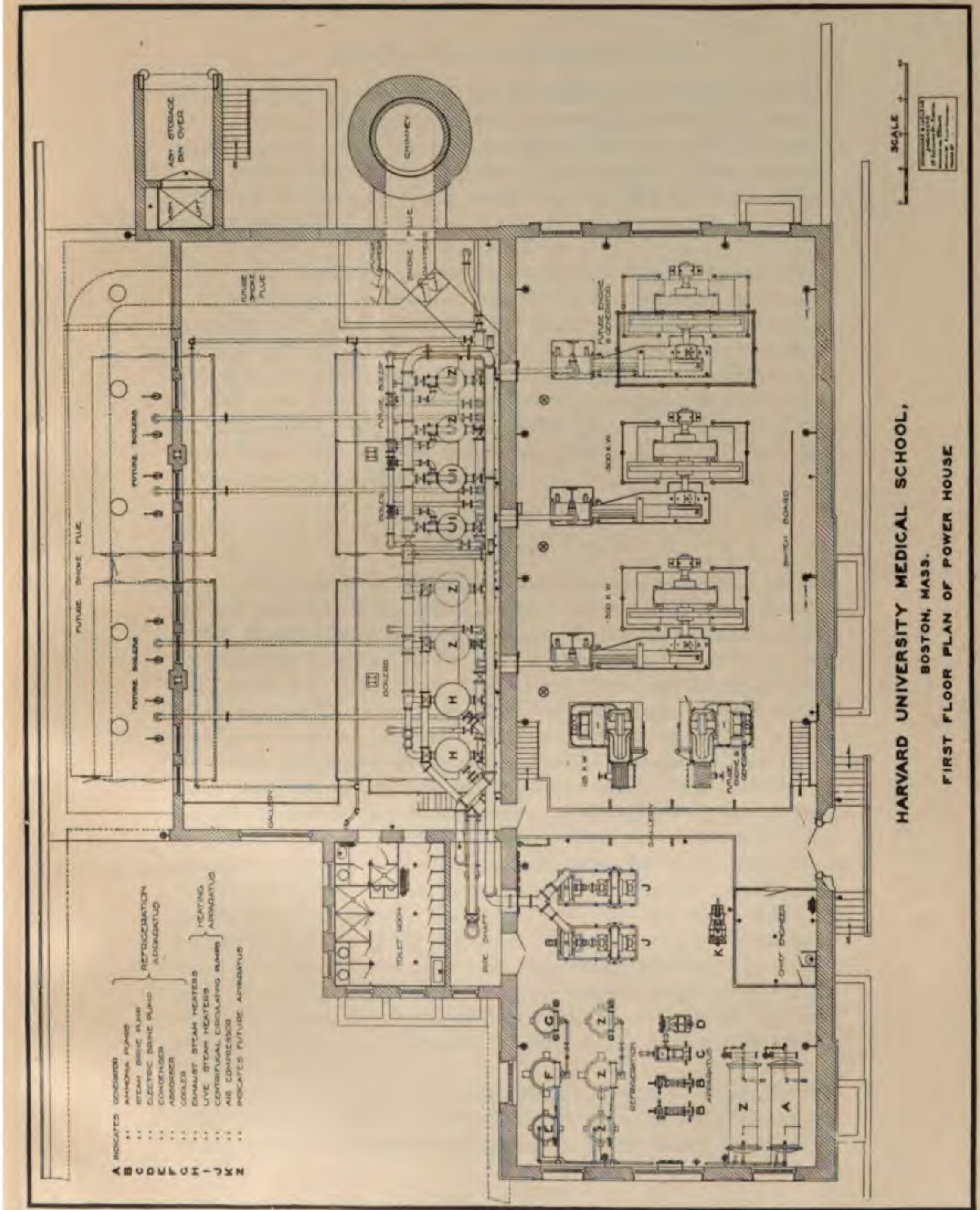

A INDICATES GENERATOR
B " AMMONIA PUMP
C " STEAM BRINE PUMP
D " ELECTRIC BRINE PUMP
E " CONDENSER
F " ABSORBER
G " COOLER
REFRIGERATION APPARATUS
H " EXHAUST STEAM HEATERS
I " LIVE STEAM HEATERS
J " CENTRIFUGAL CIRCULATING PUMPS
HEATING APPARATUS
K " AIR COMPRESSOR
Z INDICATES FUTURE APPARATUS
ASH STORAGE BIN OVER
ASH LIFT
CHIMNEY
SMOKE FLUE
FUTURE SMOKE FLUE
FUTURE BOILERS
BOILERS
GALLERY
TOILET ROOM
PIPE SHAFT
CHIEF ENGINEER
SWITCH BOARD
FUTURE ENGINE & GENERATOR
300 K.W.
REFRIGERATION APPARATUS
SCALE
HARVARD UNIVERSITY MEDICAL SCHOOL,
BOSTON, MASS.
FIRST FLOOR PLAN OF POWER HOUSE

FIGURE 4

of this building is a departure from the marble of the large buildings, but its treatment in wood and plaster conforms in architectural style to the main group. This house has rooms and stalls for animals varying in size from cows and sheep to birds and guinea pigs. There is a room for special infectious cases, and above the main floor a loft for storing feed and material.

### POWER HOUSE.

One other building belonging to the Medical School plant remains to be mentioned. This is the Power House for furnishing heat, light, electricity, refrigeration, and compressed air to the several laboratory buildings, and also to the adjacent hospitals now built and to be built in the future. This building is situated some distance to the southwest of the main group, and is treated architecturally to suggest its purpose and the simple classic design of the main buildings. The equipment of this Power House was mainly an engineering problem, and is fully described by the engineers in a separate article.

## THE MECHANICAL PLANT.

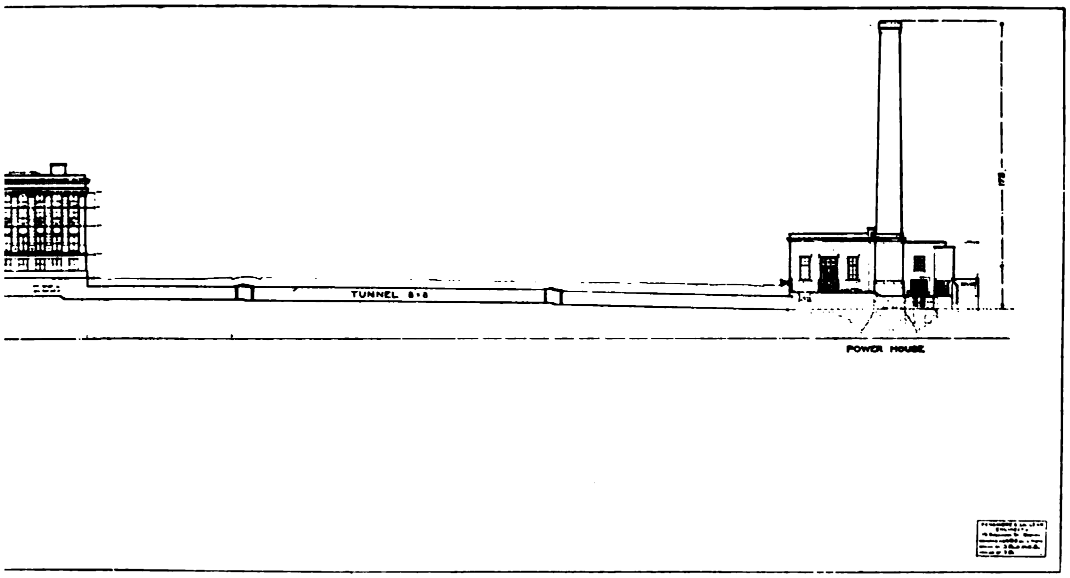
It is the purpose of this article to describe those features of the mechanical plant which may be of general interest, or which are peculiar to this plant, omitting technical details. The subject is treated under the following headings, in the order given: The Power House and Equipment; The Heating and Ventilating System; The Electric Wiring for Lighting and for Power; the Refrigeration System; and Miscellaneous Service Systems, included under which are steam and compressed air service for laboratory purposes, electric time-clocks, watchman's clocks, etc. No attempt is made to present reasons for the selection of the systems used, or to indicate the relative advantages of these systems as compared with other systems. These matters were taken up in detail in a report prepared by the engineers and presented to the Corporation of Harvard College before the preparation of contract drawings and specifications was begun. The entire plant, both as regards details of equipment, and as regards extensions for the future, is in accordance with a carefully prepared plan. An important consideration in the design of the mechanical plant was the provision for a large, but somewhat indefinite, increase in the size of the plant, for possible future hospitals or other buildings associated with the School, and for the enlargement of the School buildings.

The plan of the Medical School grounds, Figure 1, shows the five School buildings, and the possible additions to them, the Power House, the tunnel between the School buildings and the Power House, the house of the Good Samaritan Hospital, with its connecting tunnel, and the space reserved for future hospitals. It has been found convenient to designate the five buildings of the School by letters; the Administration Building is known as "Building A," and the four laboratory buildings as "Buildings B, C, D, and E;" Building B is for Histology and Anatomy, Building C for Physiology and Physiological Chemistry, Building D for Bacteriology and Pathology, and Building E for Hygiene and Pharmacology.

### POWER HOUSE AND EQUIPMENT.

The Power House is located on the north side of Vila St., a good location for this and other service buildings. The main lot is thus left free for future development, and the objectionable features of a Power House removed as far as possible from the Medical School buildings and hospitals.

Figures 3 and 4 show the basement plan and first-floor plan of the Power House, and figures 5 and 6 a cross section of the Power House, and a section through the Medical School grounds. The boiler-room is located at the rear of the Power House, so that the noise and dirt due to the handling of coal and ashes may be on the side away from future hospitals. The brick fence at the front of the Power House screens the approach to the coal-pocket and ash-bin, and incloses a yard which can be used for storage. The coal-pocket is so located that coal can be dumped directly into it from teams driven over it. A bin for the temporary storage of ashes is located above the ground level so that a wagon can be backed under it to receive the ashes. The ashes are carried up to the bin on a hydraulic lift. The engine-room, which takes up the entire front of the building, is lighted from skylights and from windows at the end. There are no windows in the front wall, which is the side facing the location for future hospitals. The chimney is high enough (175 feet) to carry away the gases and dust and prevent their being blown down into the windows of the hospitals or of the School buildings. The relative heights of the buildings and chimney are shown on the section of the grounds, Figure 6. Special care has been taken in the design of the plant to prevent smoke; in this connection a fan for running the boilers under forced draught is installed so that a cheap grade of hard coal, either alone or mixed with soft coal, can be burned. The floor plans, Figures 3 and 4, show, not merely the present equipment, but possible future equipment, present machinery being indicated by full lines and future machinery by dotted lines. Additional boiler capacity can be obtained by the addition of one boiler by the side of those already installed, and also by a complete additional battery of boilers, facing the present battery, and occupying the space now utilized as a coal-pocket.



g Relative Heights of the Buildings and the Chimney.

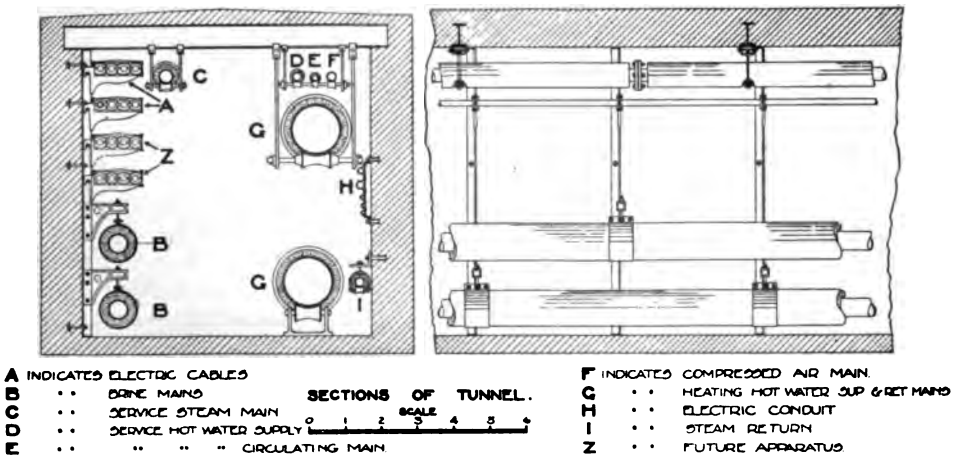


FIGURE 7

### HEATING AND VENTILATING SYSTEM.

The buildings are warmed by hot water, heated in tanks or heaters located above the boilers, in the Power House. Circulation of the hot water through the piping and radiators of the buildings is maintained by means of centrifugal pumps, located in the engine-room. The exhaust steam from all of the engines, pumps, etc., in the Power House, is used for heating the water, supplemented by live steam from the boilers when the exhaust steam is insufficient. Two of the four heaters installed are used for exhaust steam heating only, the other two being reserved for live steam heating. In this way the condensation from the exhaust steam, which contains oil, injurious to boilers, can be thrown away, while the condensation from the live steam heaters is returned to the boilers by gravity, without the use of pumps or traps. The two centrifugal pumps for maintaining the circulation of the hot water are driven by electric motors, one pump and motor being used at a time, and the other held as a reserve. It is to be noted that the exhaust steam from the engines, which drive the generators furnishing current to the pump motors, is used in heating the water of the heating system.

The temperature of the water can be readily adjusted to meet the weather conditions, thus obviating to a large degree overheating, a source of great discomfort. Moreover, overheating is an expense, and a marked saving is obtained when it is possible to regulate the temperature of the heating medium in accordance with the weather.

The buildings are heated, for the most part, by radiators located in the rooms, and ventilation is obtained by introducing fresh air at or about the temperature of the room. In some rooms, however, notably dissecting-rooms, direct radiators have been omitted, the heating being done by groups of indirect radiators located in the sub-basements.

The temperature throughout the buildings is largely regulated by varying the temperature of the water in accordance with the outside temperature, but in addition to this, the radiators are provided with automatically controlled valves operated by thermostats in the rooms. This automatic regulation is necessary on account of the difference in temperature caused by the wind, or by the uses to which a room is put, or the number of people in it. The temperature of the dissecting-rooms, which are heated by indirect radiators, is controlled by means of mixing dampers which are operated from the rooms by hand.

The general system of ventilation in the laboratory buildings is shown in Figures 12, 13, and 14, typical floor plans. Figure 16 shows a typical half plan, on a larger scale, and a typical cross-section and a typical longitudinal section through one of the wings. The fresh air for venti-

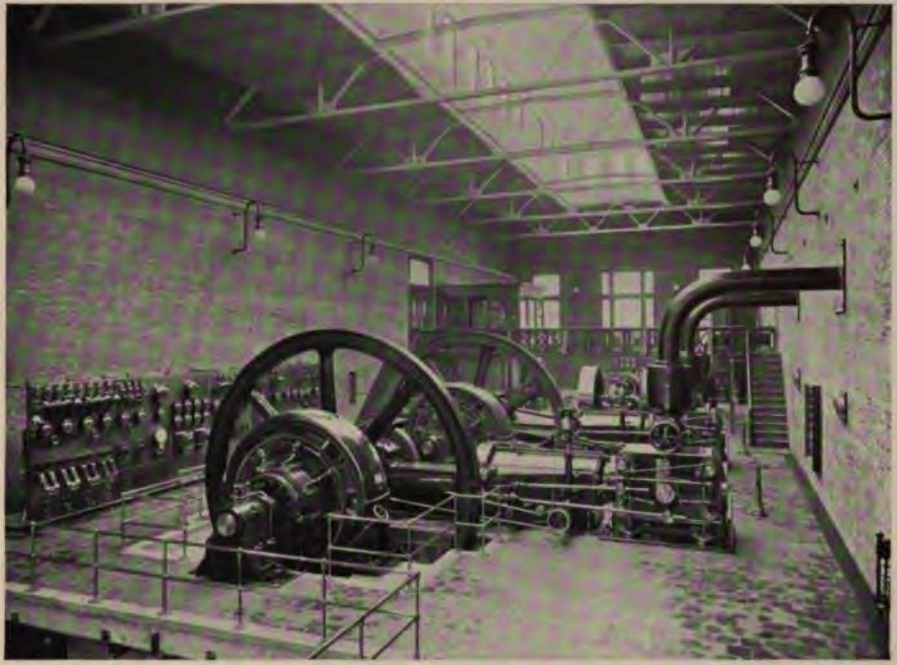


FIGURE 8. Photograph of Engine-Room in Power House, showing the two large Engines and Generators in the foreground, with the Main Entrance, Engineer's Office, and Gallery in the rear.

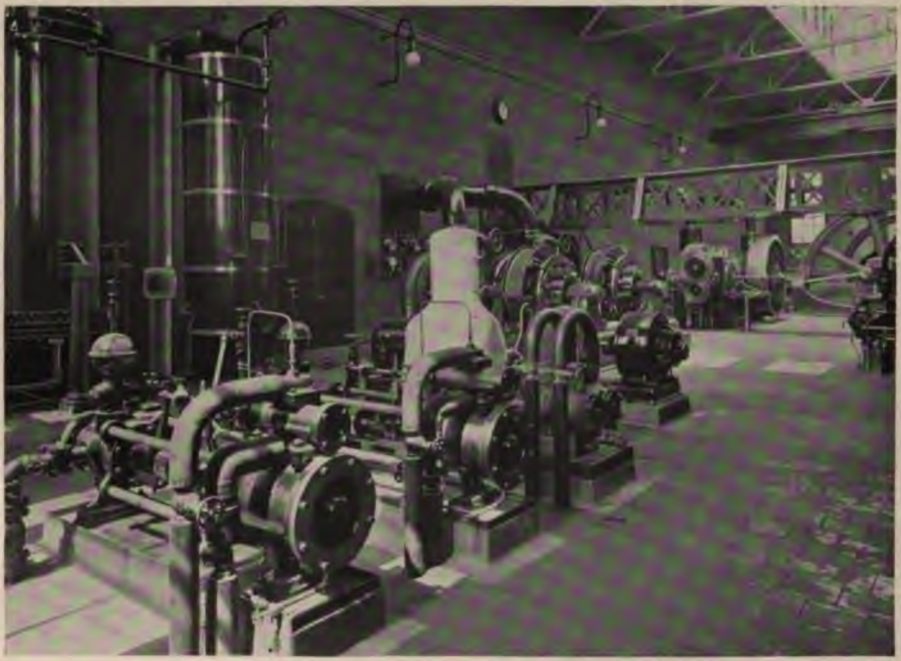


FIGURE 9. Photograph of Engine-Room in Power House, showing Refrigerating Apparatus in the foreground.

lation enters the sub-basements at the rear of the central parts of the buildings, is heated to the desired temperature by indirect radiators, screened of dust and dirt by special screen bags, and discharged by two inlet fans, motor driven, one for each wing, into main air-ducts or pressure-chambers running the length of the wings, in the sub-basements. The main air-ducts are of masonry, and are large enough for an attendant to enter them for cleaning, adjusting dampers, etc., and are as free from pipes and apparatus as possible, so that they may be kept clean. The air passes from the main air-ducts to the rooms above through individual galvanized iron ducts, one to each room.

The vitiated air is withdrawn from the rooms, through galvanized iron outlet ducts, by means of fans, located on the roofs. There is a main outlet duct on the roof of each wing, into which all the outlet ducts from the rooms connect and from which the outlet fan discharges the vitiated air. These main outlet ducts, like the main air-ducts in the sub-basements, are large enough for an attendant to enter for the purpose of adjusting dampers at the tops of the outlet ducts, for starting and stopping the motors which run the outlet fans, etc. In general, there is one main outlet fan for each wing of each laboratory building, but in special cases additional fans are installed.

The system is flexible and can be made to give satisfaction under varying conditions; both the inlet and outlet fans can be run at speeds to correspond with the amount of ventilation required, and when a building is only partly in use the outlet fan need not be run.

The ducts, both inlet and outlet, are located, for the most part, in the corridor walls, which are specially framed for the purpose, so that they interfere very little with the design or equipment of the rooms. Being straight, with very few offsets, they do not readily catch dirt or dust, and can, moreover, be easily cleaned. There is a damper at the foot of each inlet duct and at the top of each outlet duct, readily accessible for adjustment from the main air-ducts in the sub-basements and the main outlet ducts on the roof. Each room is numbered and the dampers correspondingly numbered, so that they can be identified at once if the ventilation of any room requires adjustment or if any room is temporarily closed, requiring the dampers to be shut to save the expense of ventilating.

The rooms in which the main stacks of indirect radiators are located are large enough for all the radiators that will be required if the buildings are extended, but the radiators now installed are sufficient only for the buildings as now built, and are consequently of different sizes for the different buildings. Figure 17 shows a typical arrangement of one of these heating stacks.

The screening of the ventilating air is done by forcing the air through bags made of heavy cotton sheeting. The bags are hung on collars in a galvanized iron ceiling and the air passes down through the open upper ends of the bags and out through the sides, as indicated in Figure 17. This system makes it possible to obtain a very large area of screening surface with a comparatively small floor area. There are no leaks through which dust and dirt can pass, as in the case with cloth screens on frames, and the bags are readily removed for cleaning, which need not be done more than once a year. Mr. C. J. H. Woodbury of the American Bell Telephone Co. holds a patent covering the fundamental principle of the system. A number of installations in the form used at the Medical School have been made by the engineers and have been found satisfactory.

The temperature of the ventilating air is controlled, as is the temperature of the rooms, largely by the adjustment of the temperature of the water of the heating system to the temperature of the outside air. In addition to this, however, the groups of indirect radiators are provided with by-pass dampers automatically controlled, by means of which cold air is by-passed around the radiators, until the mixture going to the fans is at the temperature desired.

In addition to the outlet fans of the general ventilating system, special fans are located on the roof for ventilating chemical hoods, fume closets, etc., and into these fans the outlet ducts from the toilet-rooms are, in general, connected. The fans are small and can be run at slight expense, whether or not the main outlet fans or any other part of the ventilating system is in use. Special akron ducts are run from the chemical hoods, with cast iron dampers at the openings into the hoods.

A typical chemical hood, with the akron outlet duct, and the arrangement of the outlet fan and connections are shown in Figure 15. There is an outlet chamber under each hood fan into which all the ducts from hoods, etc., connect, thus keeping the entire hood ventilating system entirely independent of the main ventilating system. The special outlet chambers and the ducts connecting them with the tops of the akron ducts from the hoods are exposed in the main outlet ducts. They are made of galvanized iron and are thoroughly coated with tar on the inside.

There are several "Constant Temperature" rooms where it is desired to maintain a temperature of about 98° F. at all times of the year. These rooms are heated by indirect steam radiators located in the sub-basements, the steam being taken from the service steam system, which is run for laboratory purposes, and is consequently available whether the heating system is in use or not.

On the roof of Building C there are a number of small rooms or cages intended for animals. These rooms require ventilation at practically all

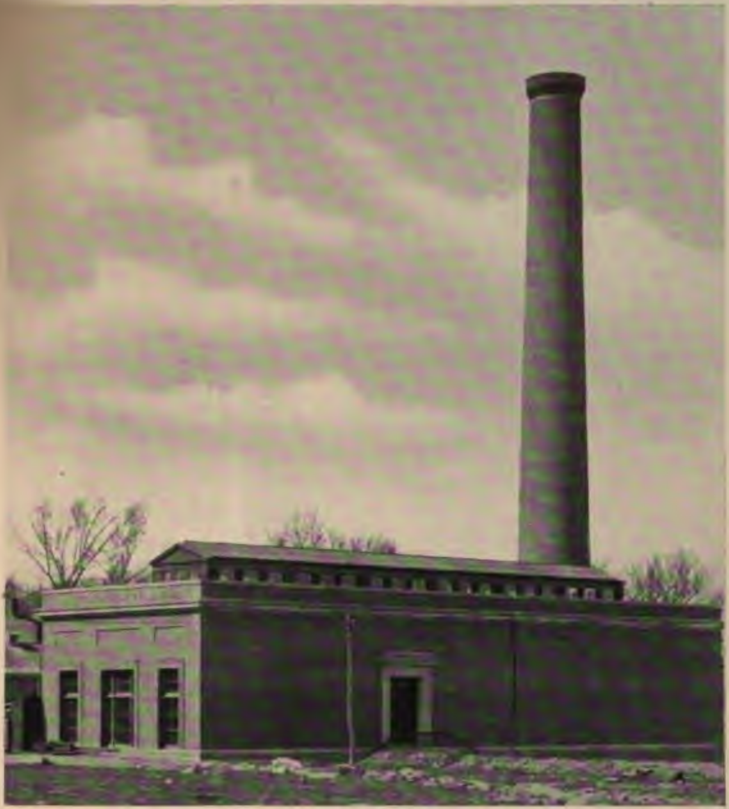


FIGURE 10. Photograph of exterior of the Power House, showing Main Entrance and Front Wall without Windows.

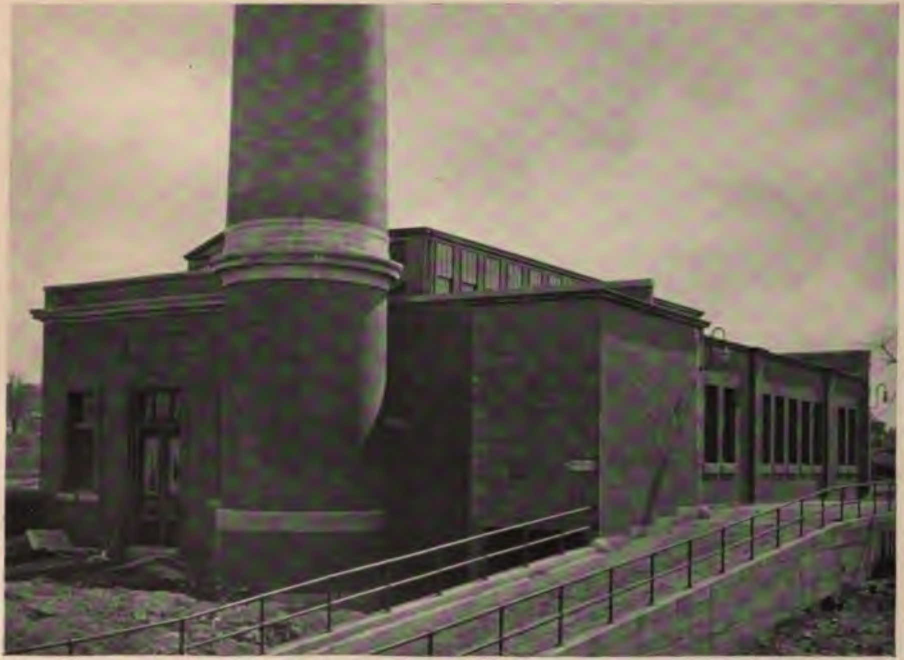


FIGURE 11. Photograph of end of Power House, showing approach to Coal Pocket.

times, whether or not the regular building ventilating system is in use. On this account a ventilating system, with inlet fan, is installed on the roof, arranged to be operated independently of other ventilating apparatus in the building.

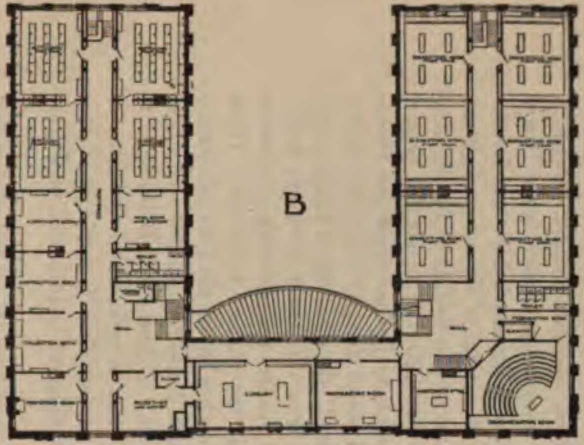
In the Administration Building the same general system of heating and screening the fresh air for ventilation is used, but the same systematic arrangement of ducts is impossible. The direct radiators on the first floor are recessed into the walls for the sake of appearance and increased floor space. Figures 18, 19, 20, and 21 show the floor plans. There are no outlet fans, the vitiated air being carried from the building by gravity. The expansion tank for the hot water heating system is located in this building; see Figure 6.

It is worthy of note that double windows have been quite generally used on the large windows in the laboratory buildings, particularly those which have northerly exposure. The double windows were installed largely to prevent troublesome drafts from the large windows, particularly when desks or tables were to be used directly under them. It was considered undesirable to have radiators under the windows. The double windows are also a considerable advantage from the standpoint of economy of operation.

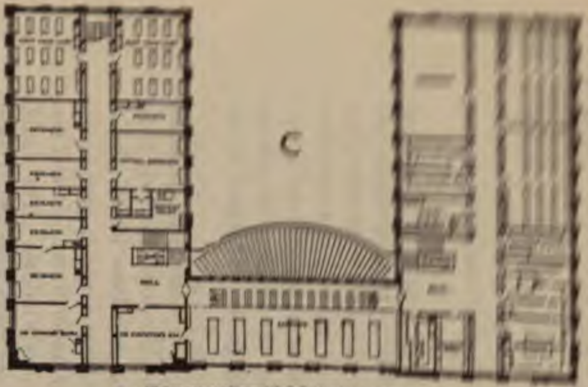
### ELECTRICAL WORK.

Electricity for lighting, for fan-motors, elevator motors, workshop motors, electric heaters, etc., is supplied from the generators in the Power House, a direct current three-wire system being used, 110 volts for the lights and 220 volts for the motors. A system of three-wire lighting mains is run throughout the sub-basements of the buildings for lighting service, and a separate system of two-wire 220 volt mains for power. Each of these systems is fed at two points by feeders from the Power House, one set of lighting feeders and power feeders being run in the tunnel from the Power House to Building C, the other set of lighting and power feeders being run directly across from the Power House to Building E. In other words, the two sets of feeders connect with a network of mains which join the switch-boards in the various buildings. There are nine of these switch-boards, one in each wing of the four laboratory buildings, and one in the Administration Building. Connecting mains are also run from Building E to Building D and from Building C to Building B. This system is used to obtain a uniform distribution of voltage, and is less expensive with two feeders than it would be if only one feeder were used. The general arrangement is indicated on Figure 22.

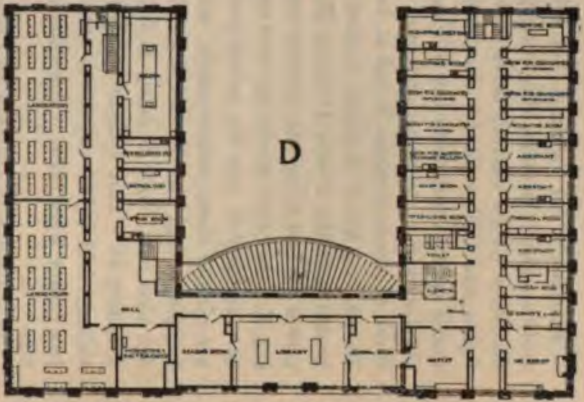
If extension is required by the erection of hospitals, it is probable that



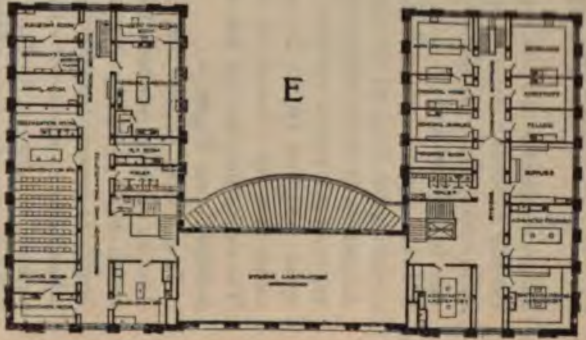
HISTOLOGY AND ANATOMY BUILDING
SECOND FLOOR PLAN



PHYSIOLOGY AND PHYSIOLOGICAL CHEMISTRY BUILDING
SECOND FLOOR PLAN



BACTERIOLOGY AND PATHOLOGY BUILDING
SECOND FLOOR PLAN



HYGIENE AND PHARMACOLOGY BUILDING
SECOND FLOOR PLAN

PLAN OF SECOND FLOORS.

a third set of feeders would be run from the Power House to a central location beyond Building A of the Medical School. Mains would also be run, connecting the end of this feeder with the end of the feeder which now runs through the tunnel to Building C. The set of feeders from the Power House to Building E is not yet completed, since, if hospital buildings are erected between Building E and the Power House before this feeder is needed for the purposes of the School, it is probable that the feeder would be run, for part of its length at least, through the basements of some of the hospital buildings. The Good Samaritan Hospital is now temporarily connected by means of cables run direct from the Power House through the pipe tunnel, but it must eventually be connected at some point on the present or future system of mains.

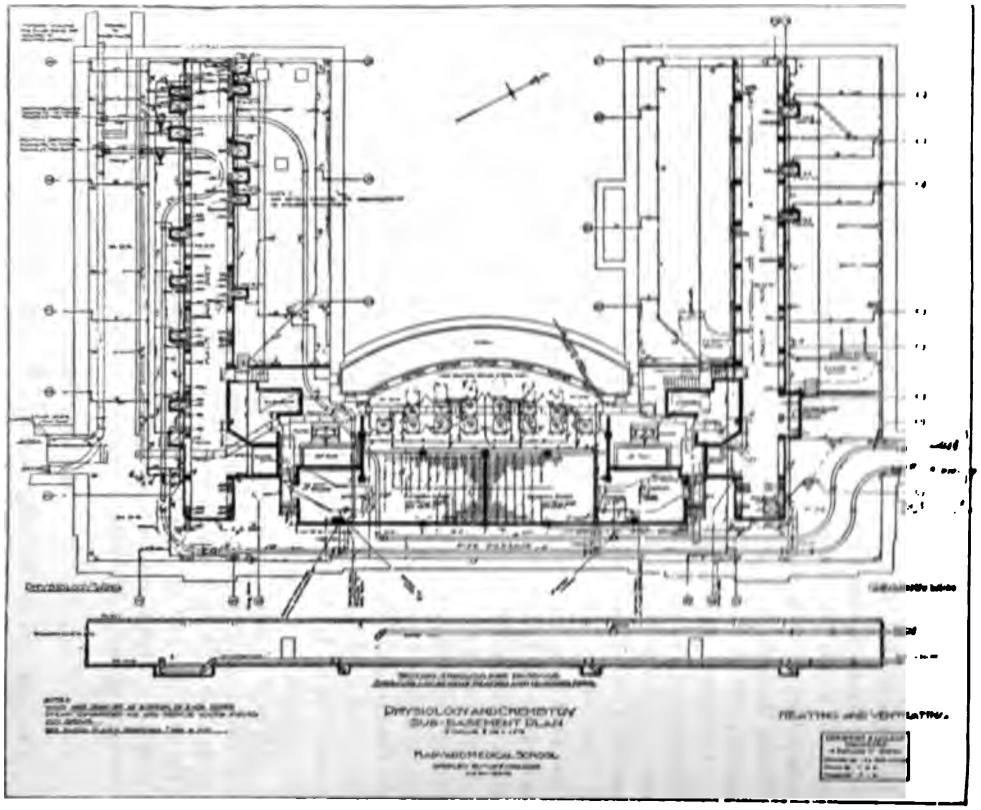
The power feeders and mains and the lighting feeders and mains are independent of each other from the switch-board in the Power House, but parallel to each other throughout their entire length. The arrangement of the cables in the tunnel is indicated in Figure 7.

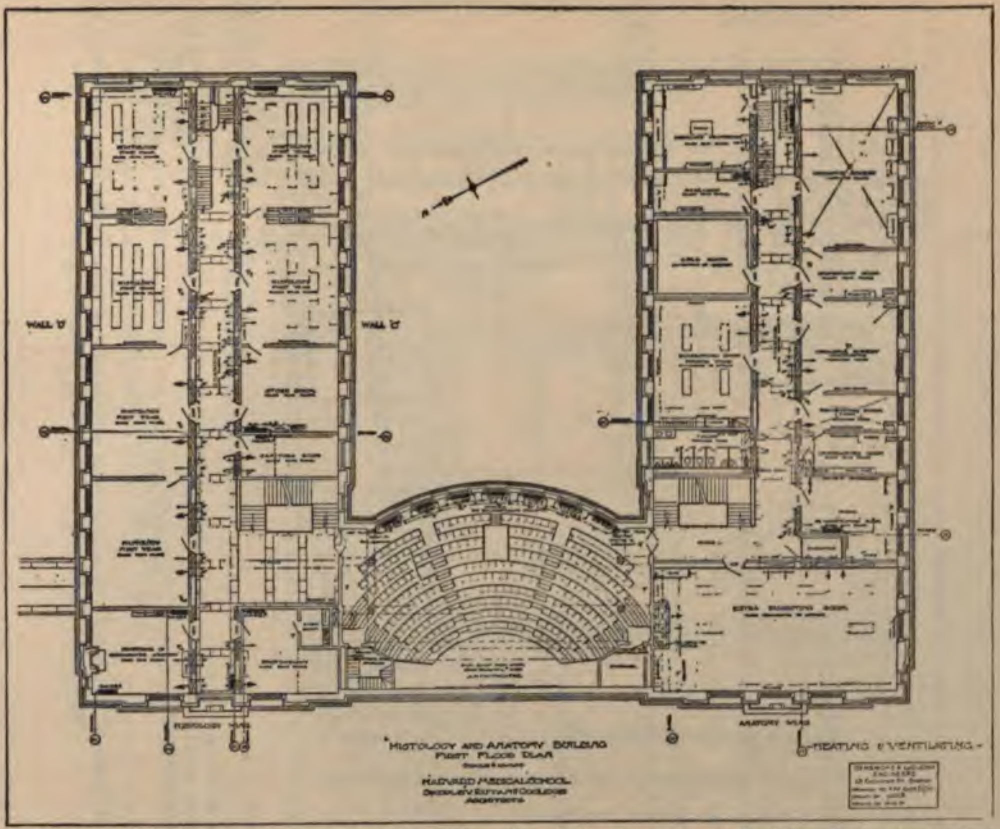
The wiring system in the buildings is designed to fulfil the requirements of laboratories. There is a separate cut-out cabinet in practically every room, fed from the switch-boards in the sub-basements, so that each room is independent, and as the cut-out cabinets are located near the floor they are readily accessible. Opportunity is given in every room for the addition of circuits for special work requiring arc lamps, electrical heaters, or other electrical apparatus. In some of the rooms, notably in the General Chemistry Room, Building C, special cut-out cabinets have been installed for electric-heater circuits, fed by special mains from the switch-board in the sub-basement. Typical floor plans showing the cut-out cabinets and building wiring are indicated in Figures 23 and 24.

All of the rooms are provided with lights for general illumination and, in addition, with special lights for work-benches, tables, hoods, etc. Only those fixtures for such special lights were designed by the engineers. The corridor and stairway lights are controlled by switches by means of which night lights can be turned on and off by the watchman as he makes his rounds, or by a physician or student engaged in night work.

### REFRIGERATION.

The principal use of refrigeration in the Medical School is the preservation of cadavers, the room for which is located in Building B, the building for Histology and Anatomy. There are, however, a number of comparatively small cold rooms in the other buildings where refrigeration is necessary. All of the cold rooms are cooled by means of pipe coils through which cold brine is circulated. None of the dissecting-rooms are cooled at present, but space is reserved in the sub-basement of


PHYSIOLOGY AND CHEMISTRY
SUB-BASEMENT PLAN
HARVARD MEDICAL SCHOOL
HEATING AND VENTILATING
PIPE PASSAGE



Figures 12 and 13. Sub-basement plan of Building C and First-floor plan of Building B, showing typical arrangement of Heating and Ventilating Apparatus, locations of Ducts, etc., in the Laboratory Buildings.

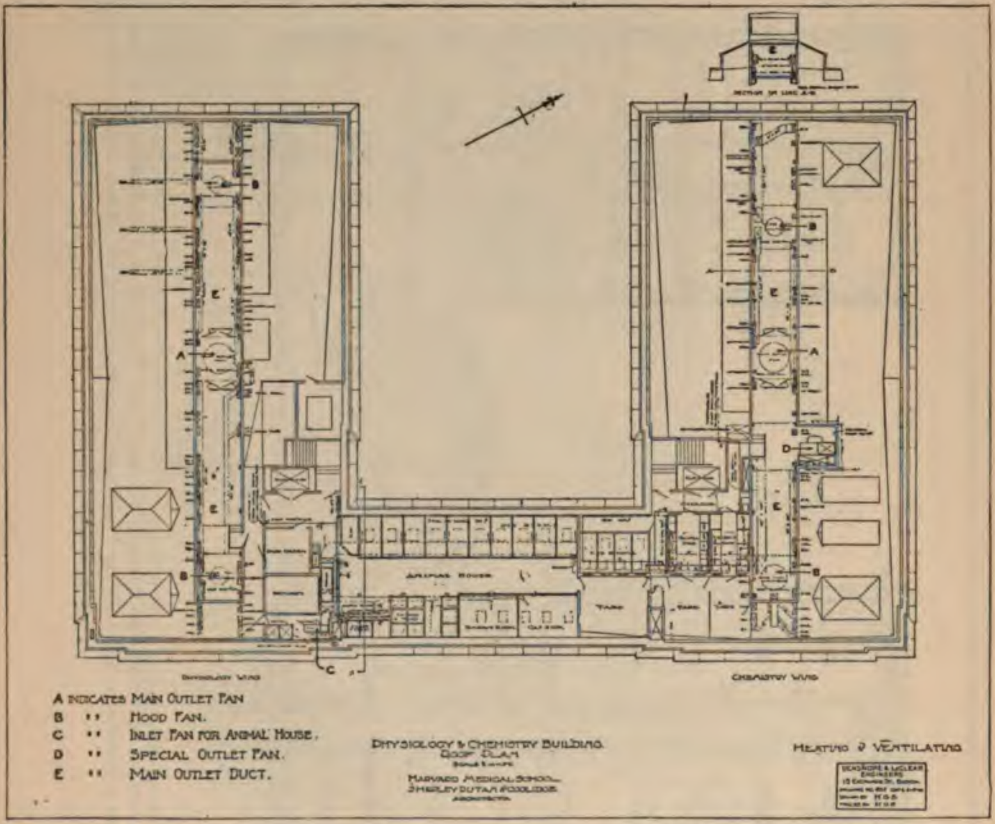


Figure 14. Roof-House of Building C, showing typical arrangement of Main Outlet Duct, Fans, etc., and Special Fan and Ducts for Ventilating Animal-House,

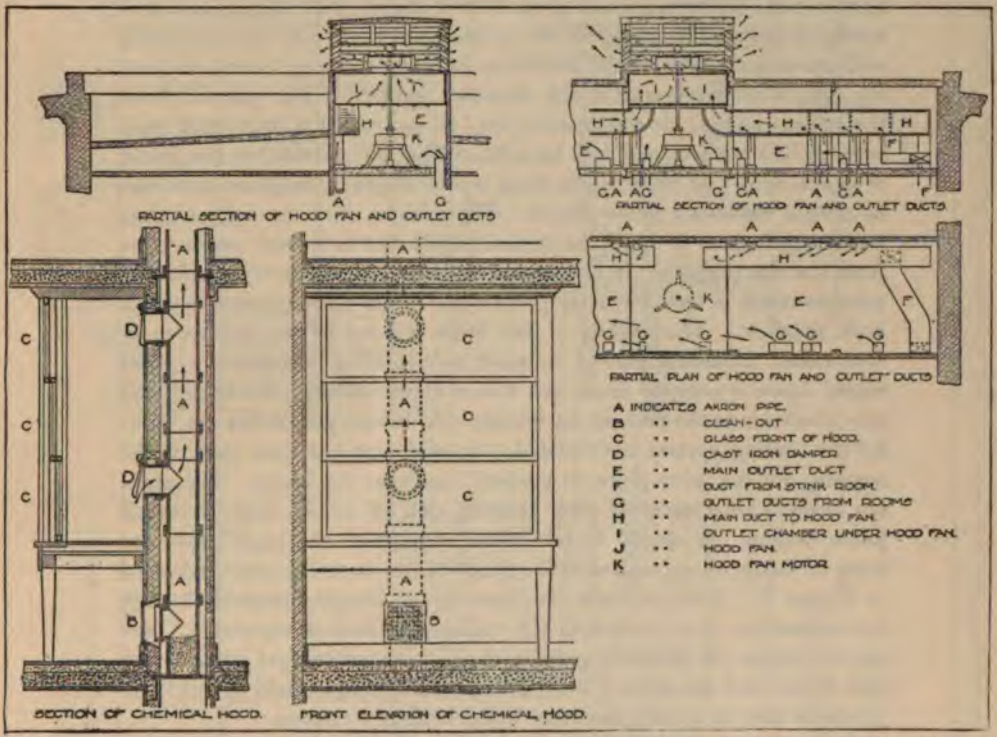

PARTIAL SECTION OF HOOD FAN AND OUTLET DUCTS
PARTIAL SECTION OF HOOD FAN AND OUTLET DUCTS
PARTIAL PLAN OF HOOD FAN AND OUTLET DUCTS
SECTION OF CHEMICAL HOOD.
FRONT ELEVATION OF CHEMICAL HOOD.
A INDICATES AKRON PIPE.
B " CLEAN-OUT
C " GLASS FRONT OF HOOD.
D " CAST IRON DAMPER
E " MAIN OUTLET DUCT
F " DUCT FROM STINK ROOM.
G " OUTLET DUCTS FROM ROOMS
H " MAIN DUCT TO HOOD FAN.
I " OUTLET CHAMBER UNDER HOOD FAN.
J " HOOD FAN.
K " HOOD FAN MOTOR

FIGURE 15. Typical arrangement of Outlets from Chemical Hoods; Partial Plan and Sections of Roof-House, showing Fan and Ducts, Chemical Hoods.

Building B, where apparatus for this purpose can be installed when desired.

The refrigeration apparatus is located in the Power House, the "absorption" system being used. A well has been driven to supply the cooling water. The special feature worthy of note in connection with this apparatus is that it is designed for the use of exhaust steam from certain parts of the apparatus in the Power House, thus making a marked saving in the cost of operation, for in this plant there will be considerable exhaust steam which would otherwise be wasted during warm weather, the time when refrigeration will be most required. The exhaust from the various pumps, air-compressors, etc., is used under a small back pressure for this purpose, and will be sufficient for the present, but the piping is so arranged that the exhaust from one of the small engines could also be used if necessary in the future. The exhaust from the large engines is not used, since it would be uneconomical to run a back pressure on them for this purpose. In this connection it is interesting to note that the exhaust steam is used for heating the water in the heating system without back pressure. The cooling of the brine is done by the expansion of compressed ammonia gas, as in most refrigerating installations. The cooled brine is pumped from the Power House through the tunnel and sub-basements to the coils in the various cold rooms, just as the hot water for the heating system is circulated. Special care has been used in the covering for the brine pipes, to prevent loss from the mains. The pipes are covered with sectional cork covering put on in two layers with all joints broken. A special feature is the support of the pipes; they are hung by bands of galvanized iron outside of the covering, as is indicated in Figure 7. This prevents the necessity of hangers passing through the insulation, as is the case in the ordinary method of support. There are two pumps for circulating the brine, — one a centrifugal pump driven by a motor, and the other a direct-acting steam pump. Only one of these pumps is used at a time, the other being held as a reserve.

A closed system of brine circulation is used; that is to say, the circulating pump forces the brine through the mains to the cooling coils and back through a return main to the refrigerating machinery, and hence again to the pump. In this way the only head against which the pump has to act is the friction head caused by the flow of the brine through the pipes and coils. An open expansion tank is connected with the system above all the coils, just as in the case of the hot water heating system, to free the system of air and to allow for the expansion and contraction of the brine.

There is a large closed tank in the basement of the Power House through which the brine circulates, thus making it possible, due to the

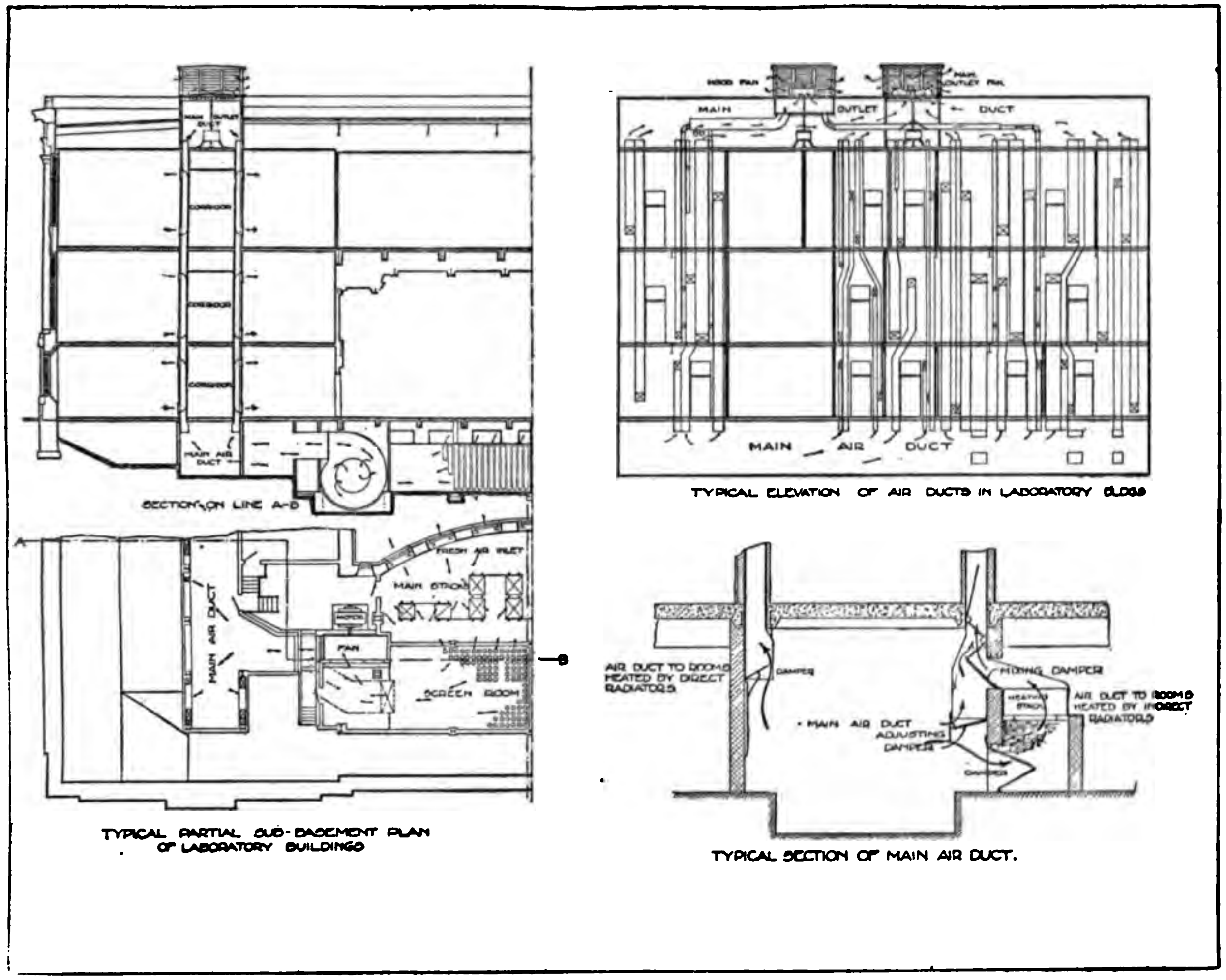


**Figure 16.** Sub-basement Plan, Sections, and Elevations, showing typical arrangement of Heating and Ventilating Apparatus in Laboratory Buildings.

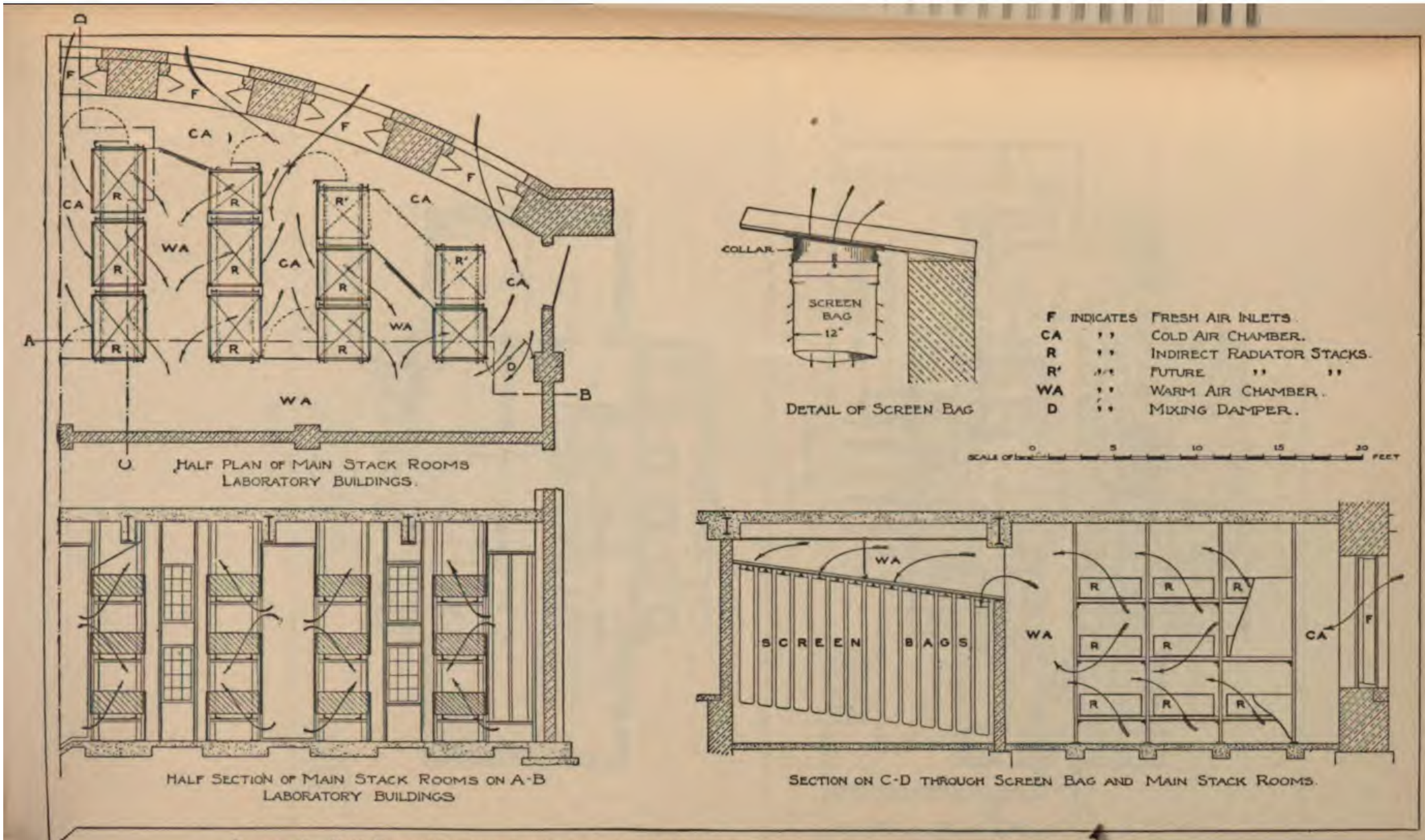
storage in the tank, to run the brine-circulating pump and do considerable cooling after the refrigerating apparatus is shut down. The refrigerating apparatus for the present and for the future is shown on the first floor plan of the Power House, Figure 4.

The room for the preservation of cadavers is shown in Figure 25. It is in reality two rooms opening on to an ante-room, to which admission is obtained through the corridor of the basement floor of Building B. At the rear of the ante-room there is a small refrigerator box for the storing of small parts. The ante-room serves as an air lock, an important consideration in the economy of operation. The use of two rooms makes it possible to store all of the material temporarily in one room while the other is being cleaned, or to close one room entirely when there is not sufficient material on hand to warrant the use of both. The cooling coils are located on the ceiling, and are divided into parts so arranged that each part may be cut out periodically for the removal of frost. The valves for the coils are all located in the ante-room, where the main distributing pipes are run. One of the smaller cold rooms is also shown in Figure 25.

### MISCELLANEOUS SERVICE SYSTEMS.

Pipes are run from the Power House through the tunnels and sub-basements to the School buildings for supplying steam and compressed air. The steam is carried at about 50 pounds pressure, and is used largely for laboratory purposes. Compressed air is required in the laboratory buildings for blow-pipes, filters, and other laboratory purposes. The air is compressed in the Power House by a steam compressor, and is carried at about 50 pounds pressure to the buildings. In each building where air is required there is a storage tank and a reducing valve which maintains a lower pressure, from 5 to 20 pounds, according to requirements. Compressed air is also required throughout the buildings for the automatic control of radiator valves, mixing dampers, etc. The air used for these purposes is supplied through the same main from the Power House as far as Building C, but from this point separate mains are run through the sub-basements. In each building there is a storage tank, reducing valve, and filter, from which small pipes are run to the various valves, dampers, thermostats, etc. Advantage is also taken of the compressed air system to locate nozzles near the electrical machinery, in the Power House, for cleaning the commutators, armatures, etc.

The service hot water is heated in the Power House in two heaters, one using exhaust steam and the other live steam; the latter being used only when sufficient exhaust steam is not available. The circulation of the water in the mains is maintained by means of a small centrifugal pump, driven by a motor.



HALF PLAN OF MAIN STACK ROOMS LABORATORY BUILDINGS.

DETAIL OF SCREEN BAG

HALF SECTION OF MAIN STACK ROOMS ON A-B LABORATORY BUILDINGS

SECTION ON C-D THROUGH SCREEN BAG AND MAIN STACK ROOMS.

FIGURE 17. Half-Plan and Sections, showing typical method of Heating and Screening the Ventilating Air in the Laboratory Buildings.

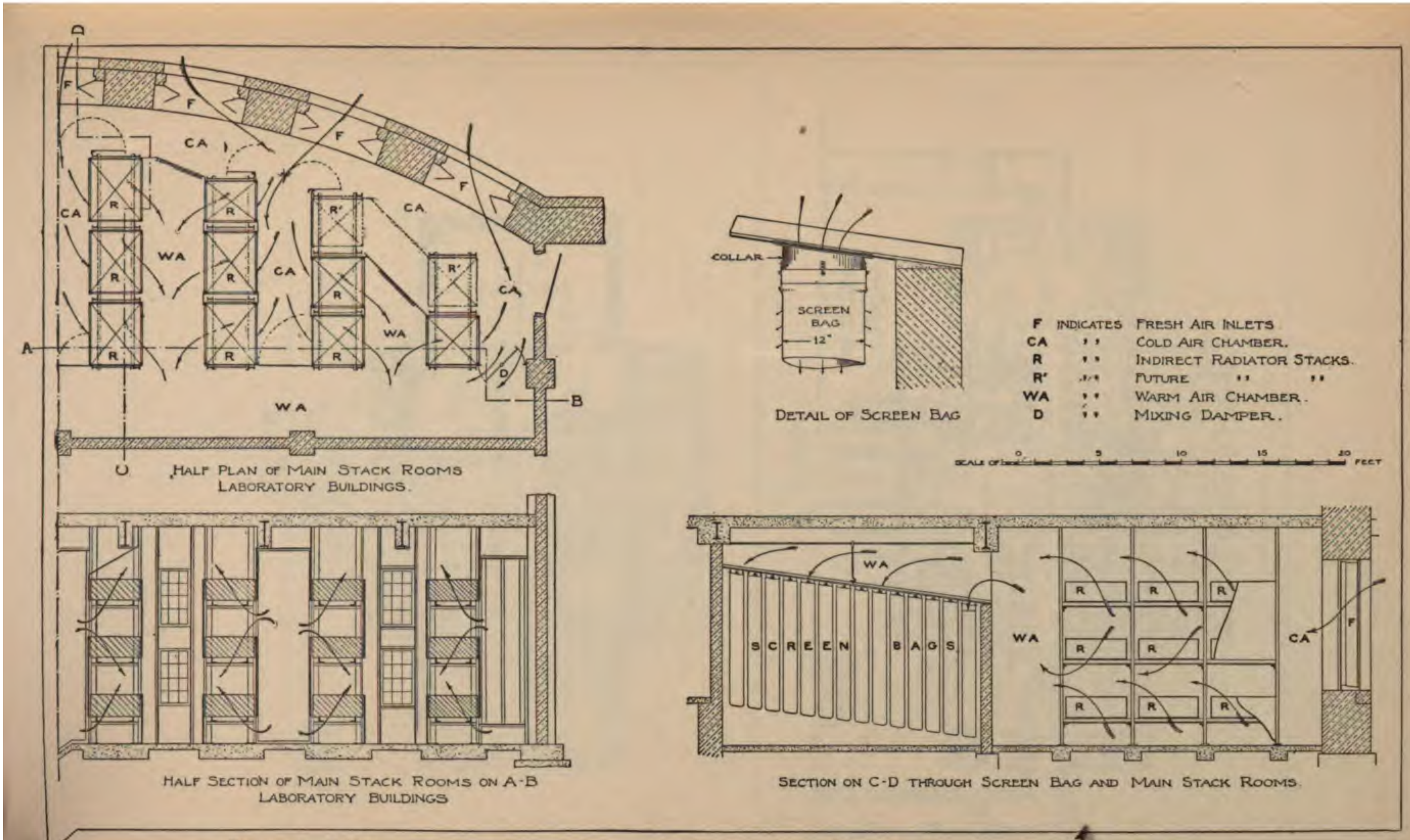
storage in the tank, to run the brine circulating pump and do considerable cooling after the refrigerating apparatus is shut down. The refrigerating apparatus for the present and for the future is shown on the first floor plan of the Power House, Figure 4.

The room for the preservation of cadavers is shown in Figure 25. It is in reality two rooms opening on to an ante-room, to which admission is obtained through the corridor of the basement floor of Building B. At the rear of the ante-room there is a small refrigerator box for the storing of small parts. The ante-room serves as an air lock, an important consideration in the economy of operation. The use of two rooms makes it possible to store all of the material temporarily in one room while the other is being cleaned, or to close one room entirely when there is not sufficient material on hand to warrant the use of both. The cooling coils are located on the ceiling, and are divided into parts so arranged that each part may be cut out periodically for the removal of frost. The valves for the coils are all located in the ante-room, where the main distributing pipes are run. One of the smaller cold rooms is also shown in Figure 25.

## MISCELLANEOUS SERVICE SYSTEMS.

Pipes are run from the Power House through the tunnels and sub-basements to the School buildings for supplying steam and compressed air. The steam is carried at about 50 pounds pressure, and is used largely for laboratory purposes. Compressed air is required in the laboratory buildings for blow-pipes, filters, and other laboratory purposes. The air is compressed in the Power House by a steam compressor, and is carried at about 50 pounds pressure to the buildings. In each building where air is required there is a storage tank and a reducing valve which maintains a lower pressure, from 5 to 20 pounds, according to requirements. Compressed air is also required throughout the buildings for the automatic control of radiator valves, mixing dampers, etc. The air used for these purposes is supplied through the same main from the Power House as far as Building C, but from this point separate mains are run through the sub-basements. In each building there is a storage tank, reducing valve, and filter, from which small pipes are run to the various valves, dampers, thermostats, etc. Advantage is also taken of the compressed air system to locate nozzles near the electrical machinery, in the Power House, for cleaning the commutators, armatures, etc.

The service hot water is heated in the Power House in two heaters, one using exhaust steam and the other live steam ; the latter being used only when sufficient exhaust steam is not available. The circulation of the water in the mains is maintained by means of a small centrifugal pump, driven by a motor.



HALF PLAN OF MAIN STACK ROOMS LABORATORY BUILDINGS.

DETAIL OF SCREEN BAG

HALF SECTION OF MAIN STACK ROOMS ON A-B LABORATORY BUILDINGS

SECTION ON C-D THROUGH SCREEN BAG AND MAIN STACK ROOMS.

FIGURE 17. Half-Plan and Sections, showing typical method of Heating and Screening the Ventilating Air in the Laboratory Buildings.

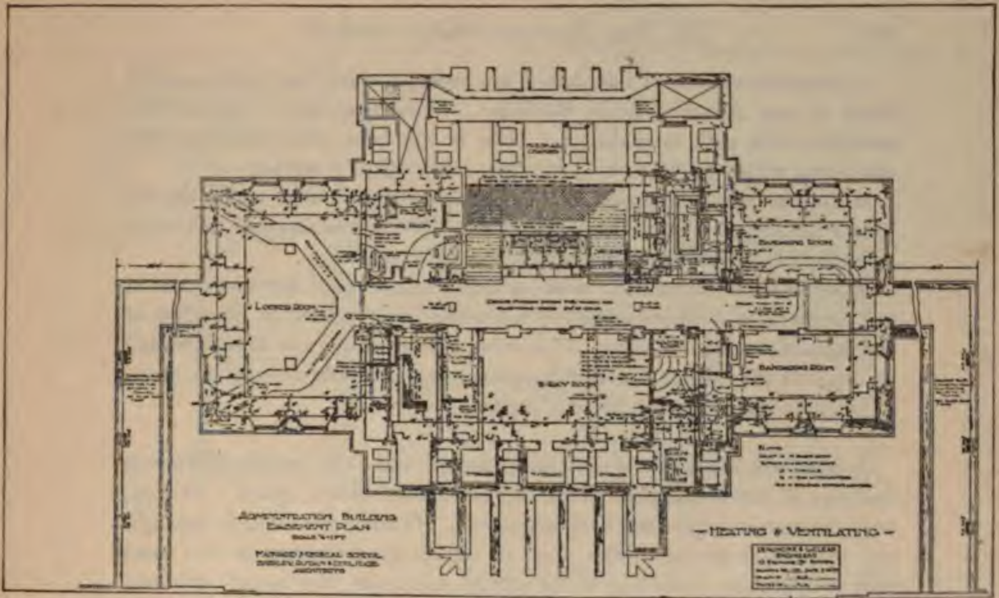


Figure 18.

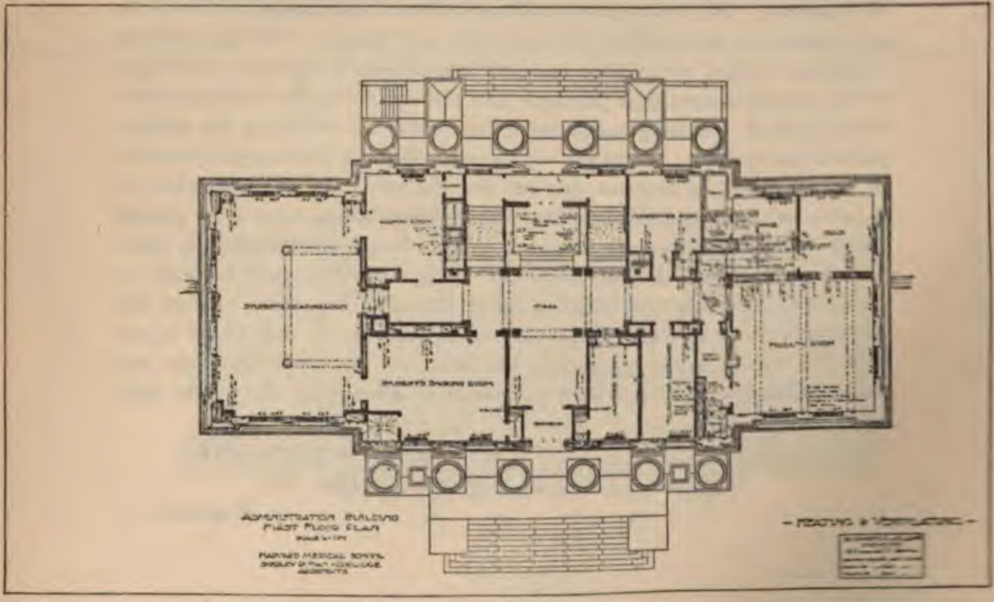


Figure 19.

A complete system of telephones has been provided for, with a central office in the Administration Building. Wire-moulding is run on the corridor walls, and, in addition, a tube is run into every room, so that telephone wires can be carried into any room without cutting.

A system of "thermophones" is installed, by means of which the engineer in charge at the Power House can tell the temperature of the air in each of the main air ducts, and in the cold rooms.

Electric time clocks have been installed in the main corridors and in the larger rooms, all controlled by a master clock located in the office of the Administration Building. Watchman's clocks have also been installed throughout the institution, their location being carefully selected to insure a complete inspection of the buildings.

It has been necessary to omit many details and more or less interesting features of the mechanical plant on account of limited space. In fact, only the barest outline has been attempted. It has been the aim throughout the entire design of the plant to obtain good service at the least cost of operation, including in the cost of operation, not merely the coal burned, the labor, etc., but the cost of maintenance, repairs, etc. In other words, permanency has been considered an important step towards economy of operation. All of the pipes, cables, etc., have been located with care so as to permit of accessibility for inspection and repairs. To this end the engineers worked in conjunction with the architects in regard to the design of the sub-basements, pipe passages, and tunnels, while the buildings were being planned. Arrangements have been made for adjusting the various parts of the systems; for measuring the work done, and for keeping records of the operation, so that not only can the best results of which the plant is capable be obtained, but advantage can be taken of the experience gained by the actual operation of the plant. It is often a serious fault in institution work that it is impossible to obtain sufficient data to make it possible to determine the exact cause of excessive coal bills. All of the machinery in the Power House has been started up, and all of it, except the refrigerating apparatus, has been put in actual use; the hot water heating system has been in operation throughout the winter with satisfactory results.

*Edward D. Densmore*, s '94,
*Gifford Le Clear*, '95,
Engineers.

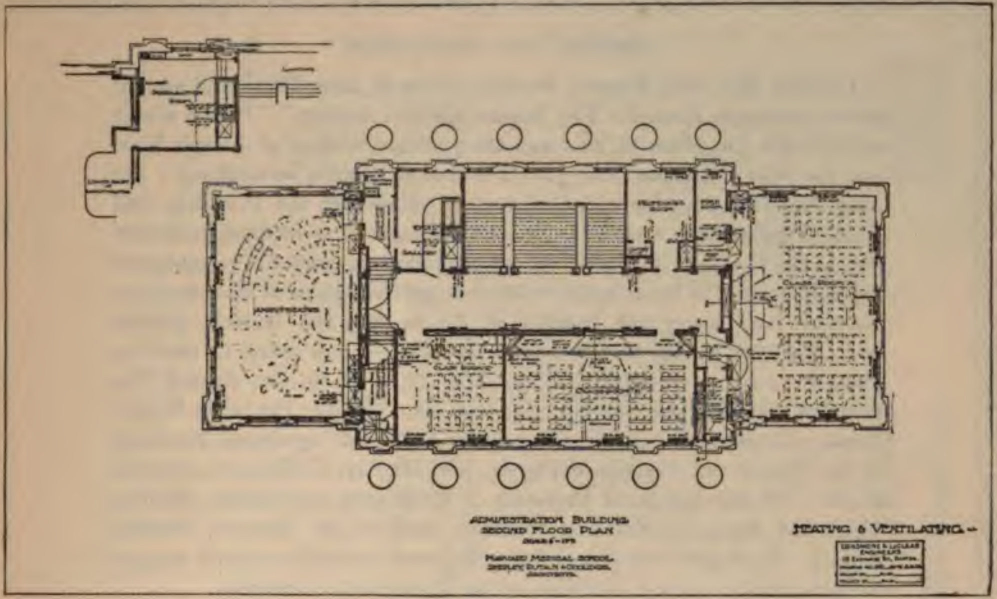


FIGURE 20.

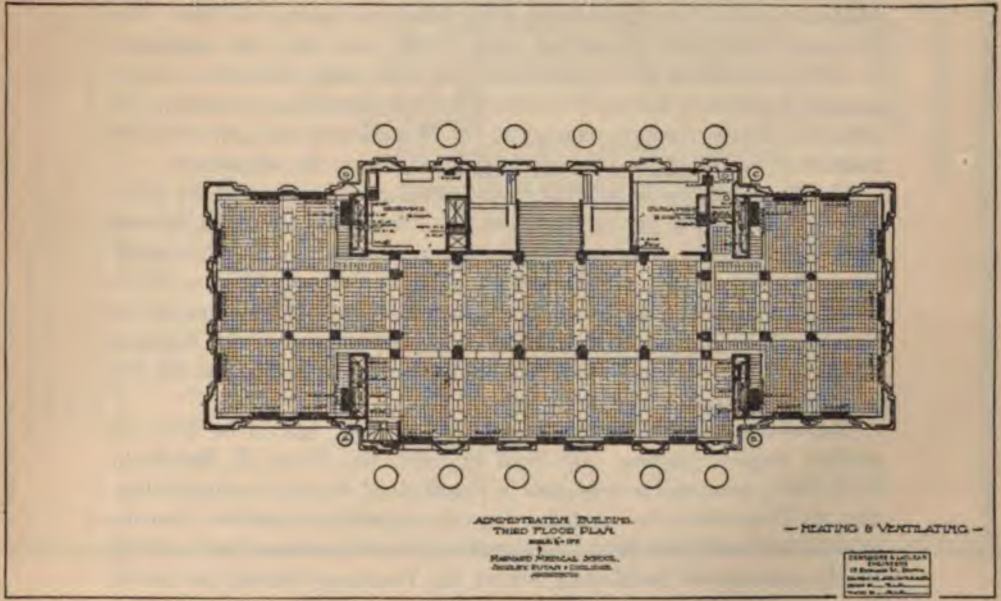


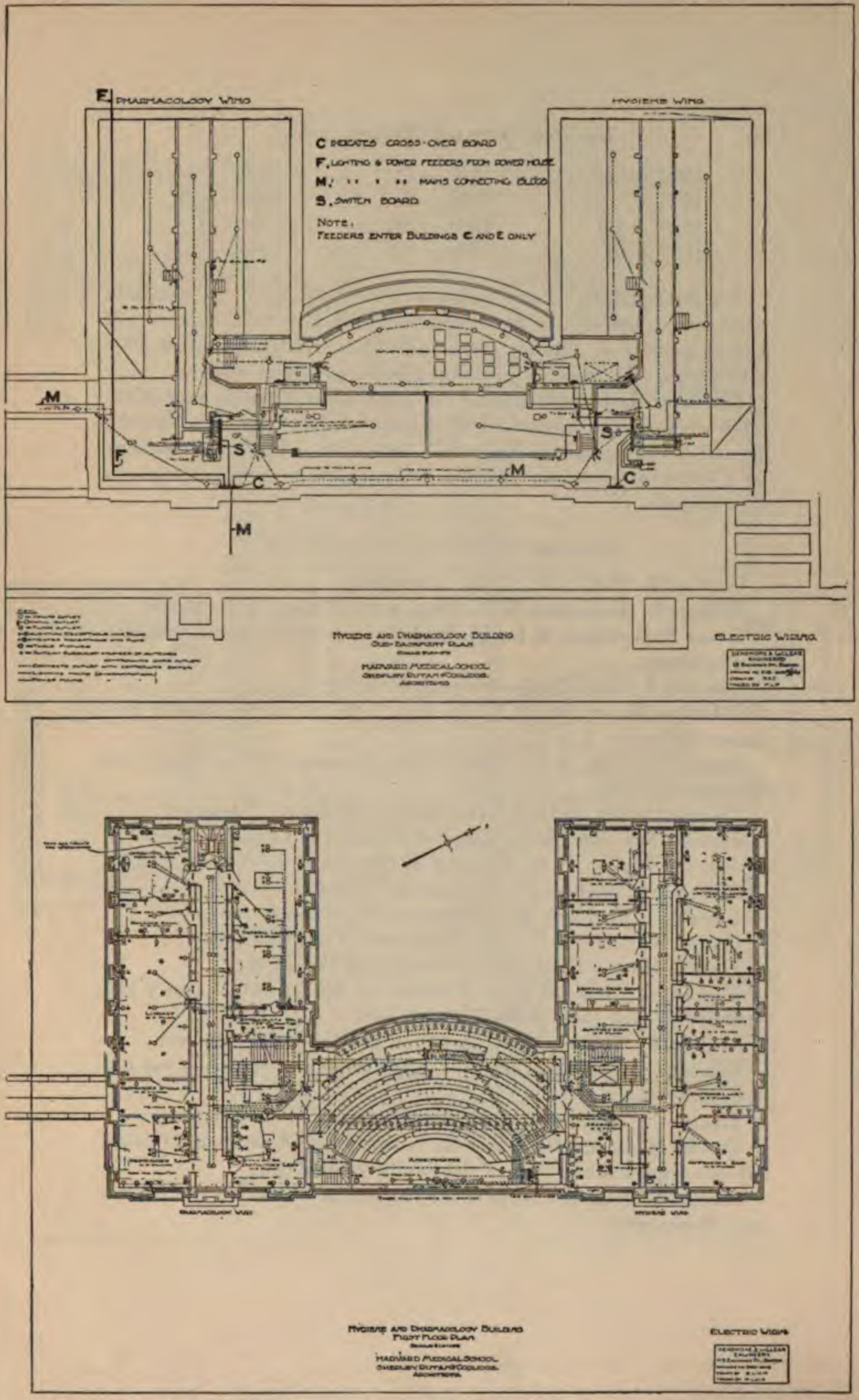
FIGURE 21.

School, the Graduate School of Comparative Medicine, and also for a hospital to be connected with the Medical School." The following May the Francis estate in Longwood, between Longwood Ave. and Francis St., covering an area of about 25 acres, was chosen, and 20 friends of the School bought and held it until funds could be raised for the buildings. Drs. H. P. Bowditch and J. Collins Warren at once made a canvass for the required sum. Mr. J. P. Morgan contributed $1,185,000; Mr. J. D. Rockefeller, $1,000,000; Mrs. C. P. Huntington, $250,000; Mr. James Stillman, $100,000; and other contributors of smaller sums, $471,725. This subscription, added to funds set aside by the Corporation and to the previous permanent funds of the School, assured the erection and maintenance of the five buildings which constitute the new Harvard Medical School. In 1902 plans were prepared by the Boston architects, Messrs. Shepley, Rutan & Coolidge (Charles A. Coolidge, H. C. 1881), and ground was broken. The work of construction has proceeded as fast as the unsettled labor conditions of the country permitted, and in May, 1906, the buildings are completed. Their formal dedication will take place next September.

Thus, from Harvard Hall and Holden Chapel to the rooms in Mason St., Boston, then to the North Grove St. Building, then to Boylston St., and now, finally, to Longwood, has the Medical Department of Harvard University changed its abode. The expansion of the School typifies the expansion of the profession and science of medicine in this country.

Down to President Eliot's administration the Medical School formed an almost independent institution, having its own treasury, its own Commencement, and its own laws. Since 1870 it has become an organic part of the University, autonomous so far as concerns its own affairs, but under the general supervision of the Corporation. Its offshoots, the Dental School and the School of Comparative Pathology, have been included in the new Faculty of Medicine which was established a few years ago. It is expected that hospitals with adequate clinical material, under the immediate control of the School, will soon be erected.

The course for a degree is now of four years' duration, and admission to regular standing is given only to candidates who have already received a degree in Arts, Literature, Philosophy, or Science from a recognized college or scientific school. The Faculty of Medicine numbers this year 34 persons, in addition to whom there are 108 instructors, lecturers, and assistants, and 4 Austin Teaching Fellows. The School has 287 students, not including those who attended the last Summer School (173). Its growth can be seen in the following table of the number of M.D. degrees conferred in the years named.


F
PHARMACOLOGY WING
HYGIENE WING
C INDICATES CROSS-OVER BOARD
F, LIGHTING & POWER FEEDERS FROM POWER HOUSE
M, " " " " MAINS CONNECTING BLDGS
S, SWITCH BOARD
NOTE,
FEEDERS ENTER BUILDINGS C AND E ONLY
M
F
S
C
M
S
C
M
HYGIENE AND PHARMACOLOGY BUILDING
SUB-BASEMENT PLAN
HARVARD MEDICAL SCHOOL
SHEPLEY RUTAN & COOLIDGE.
ARCHITECTS
ELECTRIC WIRING
PHARMACOLOGY WING
HYGIENE WING
HYGIENE AND PHARMACOLOGY BUILDING
FIRST FLOOR PLAN
HARVARD MEDICAL SCHOOL.
SHEPLEY RUTAN & COOLIDGE.
ARCHITECTS
ELECTRIC WIRING

Figures 23 and 24. Typical Basement Plan and First-Floor Plan, showing Electric Wiring System

| | | |
|---|---|---|
| 1800 — 4 | 1840 — 22 | 1880 — 45 |
| 1810 — 2 | 1850 — 34 | 1890 — 70 |
| 1820 — 12 | 1860 — 42 | 1900 — 134 |
| 1830 — 21 | 1870 — 69 | 1905 — 67 |

The recent falling off has been due to the stiffening of the admission requirements, but this, as the experience of the Law School shows, will soon be made good. Raising the standard has invariably resulted, after a few years, in a larger enrolment of a better quality of students.

This is not the place to speak of the contributions of the Harvard Medical School to medical science, nor of the many eminent men who, from the days of John Warren and Waterhouse, have been on its staff of teachers. As a matter of record we give the names of the present Faculty, with their subjects.

### HARVARD FACULTY OF MEDICINE, 1906.

Charles W. Eliot, A.M., LL.D., President.

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Clarence J. Blake, M.D., Professor of Otology.

J. Collins Warren, M.D., LL.D., Hon. F.R.C.S. (Eng.), Moseley Professor of Surgery.

Reginald H. Fitz, M.D., LL.D., Hersey Professor of the Theory and Practice of Physic.

Thomas Dwight, M.D., LL.D., Parkman Professor of Anatomy.

John H. McCollom, M.D., Assistant Professor of Contagious Diseases.

James J. Putnam, M.D., Professor of Diseases of the Nervous System.

Frederick C. Shattuck, M.D., Jackson Professor of Clinical Medicine.

Edward H. Bradford, M.D., Professor of Orthopedic Surgery.

Charles A. Brackett, D.M.D., Professor of Dental Pathology.

Thomas Morgan Rotch, M.D., Professor of Pediatrics.

Eugene H. Smith, D.M.D., Professor of Mechanical Dentistry and Orthodontia, and Dean of the Dental School.

William F. Whitney, M.D., Curator of the Anatomical Museum.

Charles S. Minot, S.D., LL.D., D.Sc., Professor of Histology and Human Embryology.

Maurice H. Richardson, M.D., Professor of Clinical Surgery.

Charles M. Green, M.D., Associate Professor of Obstetrics and Clinical Gynaecology, and Secretary of the Faculty of Medicine.

Edward C. Briggs, M.D., D.M.D., Professor of Dental Materia Medica and Therapeutics.

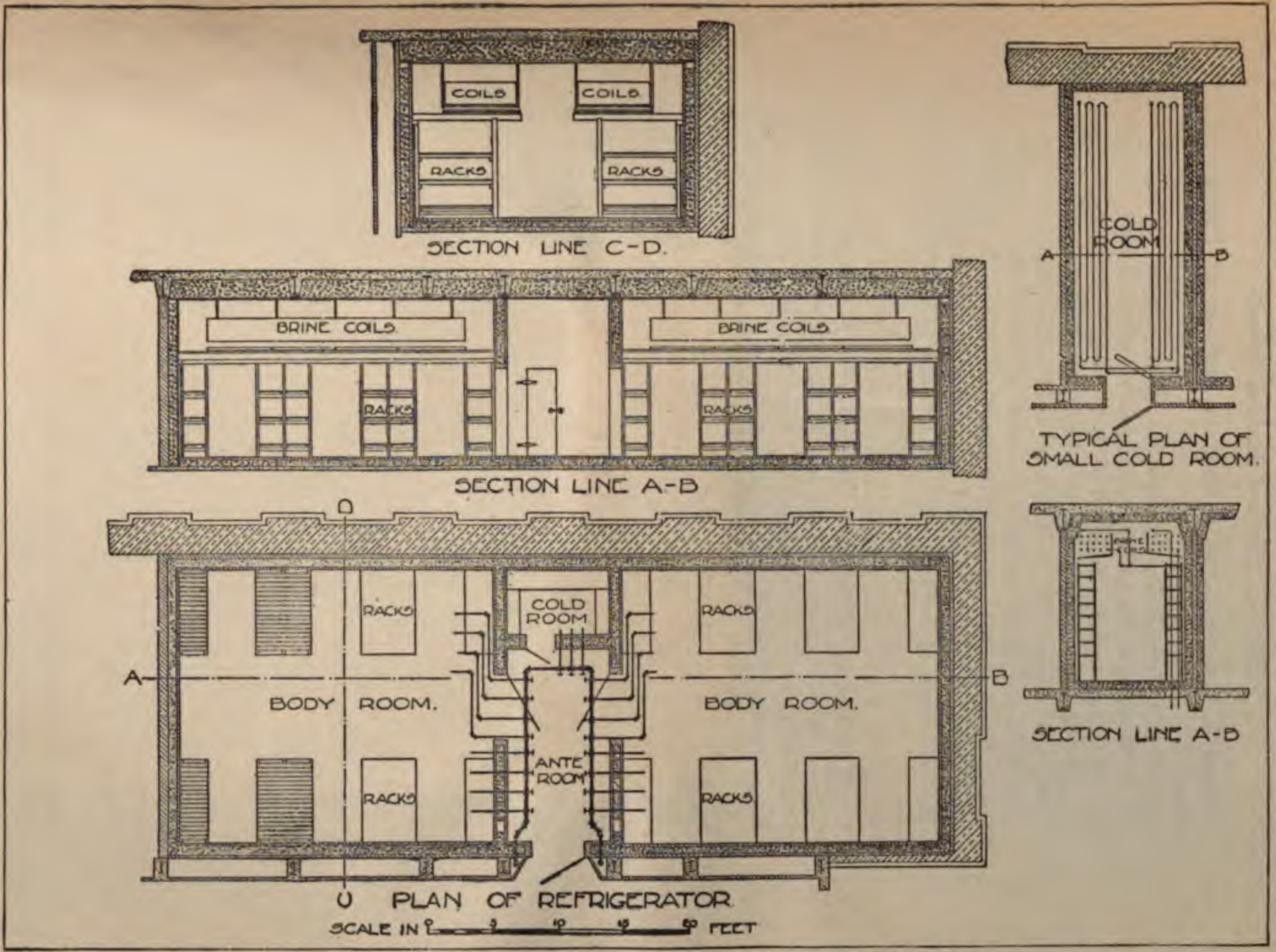

FIGURE 25. Plan and Sections of Refrigerator for Cadavers in Building B; Typical Plan and Section of small Cold Rooms in the other Laboratory Buildings.

William T. Councilman, M.D., Shattuck Professor of Pathological Anatomy.

Herbert L. Burrell, M.D., Professor of Clinical Surgery.

Myles Standish, M.D., Assistant Professor of Ophthalmology.

Harold C. Ernst, M.D., Professor of Bacteriology.

Charles Harrington, M.D., Assistant Professor of Hygiene.

William H. Potter, D.M.D., Professor of Operative Dentistry.

John T. Bowen, M.D., Assistant Professor of Dermatology.

George G. Sears, M.D., Assistant Professor of Clinical Medicine.

Franz Pfaff, M.D., Professor of Pharmacology and Therapeutics.

Theobald Smith, M.D., George Fabyan Professor of Comparative Pathology.

William T. Porter, M.D., Associate Professor of Physiology.

Frank B. Mallory, M.D., Associate Professor of Pathology.

Edward H. Nichols, M.D., Assistant Professor of Surgical Pathology.

Walter B. Cannon, M.D., Assistant Professor of Physiology.

John Warren, M.D., Demonstrator of Anatomy.

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